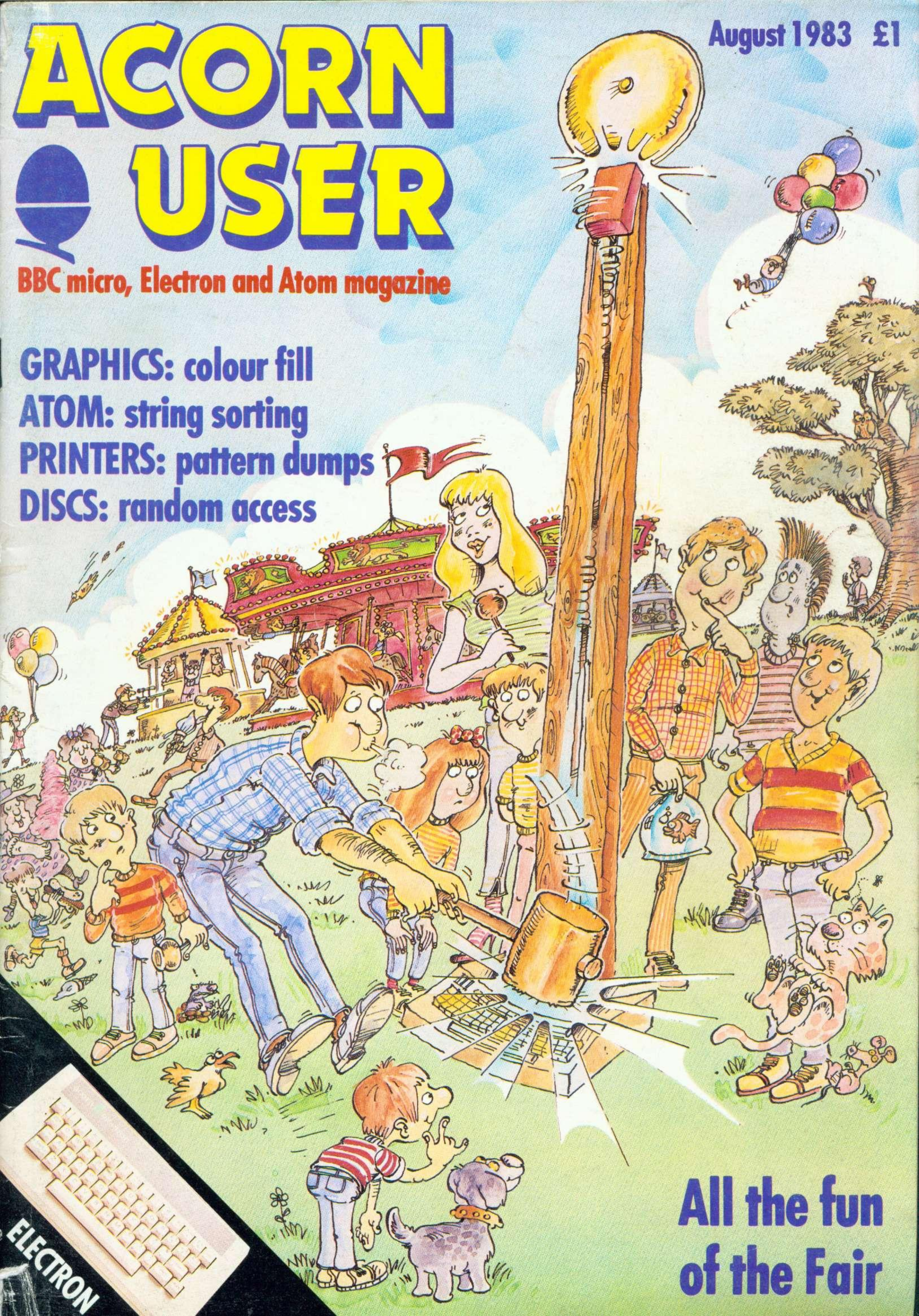
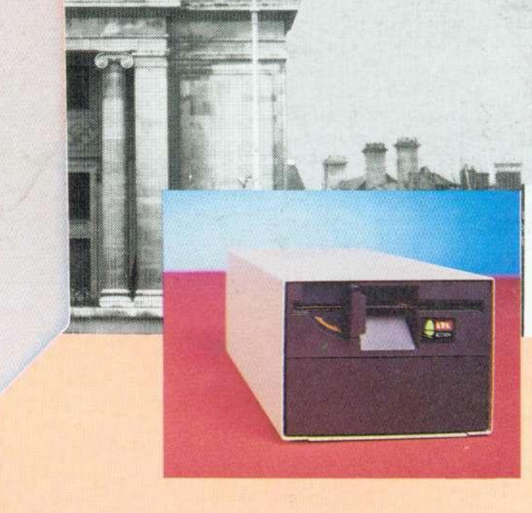

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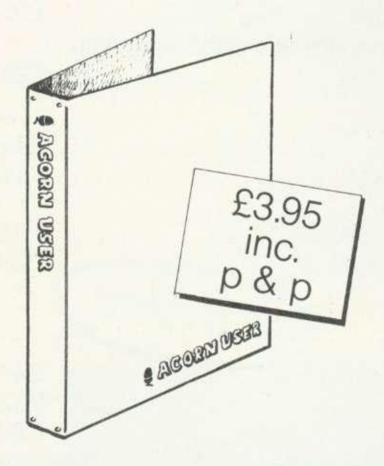
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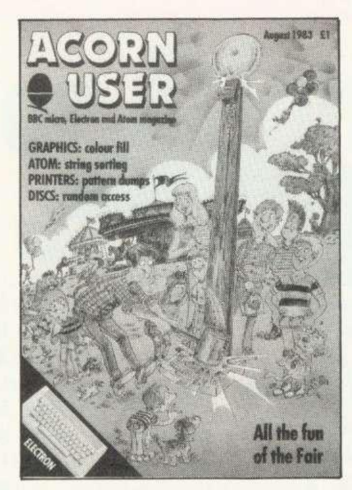
ACORN USER

AUGUST 1983
NUMBER THIRTEEN

How to submit articles: You are welcome to send articles to the Editor of *Acorn User* for publication. *Acorn User* cannot undertake to return them unless a stamped addressed envelope is enclosed. Articles should be typed or computer written with double line spacing. Black and white photographs or transparencies are also appreciated. If submitting programs a cassette or disc is vital. Payment is £50 per page or pro rata. Please indicate if you have submitted your article elsewhere. Send articles, reviews and information to: The Editor, *Acorn User*, 53 Bedford Square, London WC1B 3DZ.

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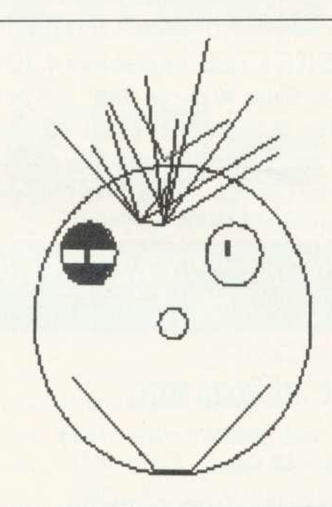
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Authors please note

We've been inundated with articles for publication – many of an extremely high standard. It takes time to read them, try listings out and edit them – which is the only way to maintain standards. Also please remember that magazines work at least two months in advance.

So please bear with us if you hear nothing for weeks (although all submissions are acknowledged).

Thanks for your patience and apologies for any frustration caused.

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Beeb set for Atlantic crossing

ACORN expects its 'souped-up' BBC micro to pass US emission and safety standards this summer, in time for a Christmas launch.

The US version will include Acornsoft's View word-processing ROM, speech synthesis, disc and Econet interfaces – and a new operating system to cope with differences in the TV display. It is expected to sell for $995.

Software is being prepared to accompany the launch, and the company is seeking programs to market. Talks with the major computer chains have stalled until the micro passes the regulations and is available for evaluation.

The first BBC TV series has been shown on America's Public Broadcasting System since April, and full-page adverts have appeared in magazines (mostly financed by Acorn).

Plans are being laid to export as much of the BBC system as makes sense, which includes second processors and the teletext adapter – although the latter depends on a Ceefax-type system being established. Talks are underway with American TV stations to look into this.

Equipment will be made in britain, but the BBC will undoubtedly commission disc drives in the US (the present ones are either Italian or Japanese in British boxes).

The disc filing system will, said a spokesman, be identical to that in the British machines.

Coping with US televisions has the major problem. Although the 'spot' flys at virtually the same screen across the screen, there are only 525 lines, as against 625 on British TVs. This means the number of vertical pixels is reduced from 1280 to 1024, although the number is constant (800) in the horizontal direction.

The table shows the number of text lines per screen page for the two systems in each mode (software writers please note).

Machine code programs and all the plot commands are changed for the US. The alterations to the operating system have been made to cope with these problems, although present software written in machine code will not make sense to the new machine.

Availability of the Z80 second processor will be a big factor in the US, as a vast amount of software is CP/M-based. Initial reaction to the BBC micro in the US computer press has been good (although the DFS has met with adverse comment because of the limit on 31 files).

Noise emission has been a major hurdle for the BBC micro because of its processing speed. The FCC (America's Home Office) is tight on this point, and the machine's case is likely to be foil lined (as are most US micros).

The second factor is safety, covering flammability and electric shock. The States is particularly hot on fire standards because of bad experience with exploding TVs in the 1950s.

Text lines per screen page

Mode	0,1,2	3	4,5	6	7
UK	32	25	32	25	25
US	25	22	25	22	20

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3. **Talking To A Machine.** Computer languages such as BASIC are discussed. How computers accept a command and the use of subroutines are shown.
4. **It's On The Computer.** How a computer stores and sorts information and the creation of a simple database are the subjects of this program.
5. **The New Media.** This program looks at computers used as means of communications such as for electronic mail, directories and banking.
6. **Sound and Moving Pictures.** Computer graphics and sound as well as voice recognition are presented, as are DRAW statements.
7. **Let's Pretend.** Computer games and simulations that provide an accurate model of the real thing, such as for training, are examined.
8. **The Thinking Machine.** Do computers think or almost think? Topics include artificial intelligence and computerized medical diagnosis.
9. **In Control.** This program presents the world of silicon chips, microprocessors increasingly used to control or run the machines around us.
10. **Things To Come.** What can we expect, asks this concluding chapter, which focuses on agriculture and information handling in banking.

THE COMPUTER PROGRAMME series is available in 16mm film and videocassette formats, and may be licensed for off-air videotaping and college television course use, from FILMS INCORPORATED, 1213 Wilmette Avenue, Wilmette, Illinois 60091. (800) 323-4222, in IL (312) 256-3200.

Presentation of *The Computer Programme* series is made possible by a grant from Acorn Computers Corporation, 400 Unicorn Park Drive, Woburn, Mass. 01801. (617) 935-1190.

ACORN COMPUTER

A 16-page, illustrated COMPUTER PROGRAMME VIEWER'S GUIDE is available from Acorn Computers for $1.00 to cover postage and handling.

CIRCLE 2 ON READER SERVICE CARD

BBC TV series and advertising spread the Acorn name

The end of the BBC micro as we know it

SOFTWARE and book publishers may be prevented from exporting BBC micro products to some parts of the world.

The Swiss engineering giant Brown Boveri Cie has already forced the BBC to write its name out in full on the micro and has had words with BBC Publications.

Now BBC Publications has warned book publishers of the possibility that Brown Boveri may prevent the name BBC being used on books bound for Europe.

The Swiss company is a household name in Europe and Africa and has registered the name BBC micro.

Auntie and her namesake appear to have agreed not to use the initials in each other's territory. The BBC has first refusal in Britain and probably the Commonwealth. The position in the US is unclear.

The BBC has already clamped down on unofficial use of its name this year, and now appears to be on the receiving end.

Trolley clamp

THE BBC has given its mark of approval to a security clamp and trolley.

With the clamp, a BBC micro is glued to a metal frame which is then locked into a second frame fixed to a desk or trolley. It costs £30 and is made by Selmor Engineering, which also provides 'official' trolleys and monitor shelves. Tel: 01–247 3344.





Zany balloon prize time

REMEMBER GRIN? Well it's zany caption time again. Our picture shows Maggie clone Alison McGuire at the recent launch of Virgin's software.

The hand holding the 'water' belongs to record supremo Richard Branson, who looked set to christen the confetti-covered 'first lady'.

Your job is to think up a 'balloon' for the picture. Entries on a postcard to our usual address. Don't know what the prize will be, but our winners never go short.

Second microfloppy uses standard interface

HITACHI 3 in microdrive are being marketed for the BBC micro.

Double side discs holding 200k are used which are enclosed in a rigid plastic case.

The single drive costs £225, and the double version £399 with the unit's packed side by side.

The disc interface is the same as that used for 5.25 in floppies and it is claimed files can be copied between the two sizes.

Acorn had planned to market microfloppies, but backed out because of standardisation problems between manufacturers of the new microfloppies.

However, Advanced Memory Services of Warrington have taken the plunge and follow Bats and Cuman into the 3in market.

Acornsoft will release 12 tapes for Electron

A DOZEN programs covering languages, games and education have been re-written for the Electron in time for the machine's launch.

Acornsoft boss David Johnson-Davies confirmed the 12 as: Forth, Lisp, Snapper, Monsters, Meteors, Starship Command, Chess, Draughts and Reversi, Creative Graphics, Graphs and Charts, Tree of Knowledge and Personal Money Management.

The major reasons for the re-write are hardware differences between the BBC micro and Electron and to speed the programs up as the new machine is that much slower (see page 43).

Several new facts have come to light since Paul Beverley's review of the 'Elk' was written (he used a field trials machine).

On production machines, a plastic cover will be provided for the edge connector at the rear of the machine to prevent the power supply being shorted.

Also, the MOS and Basic will be incorporated on one 32k chip – but the second socket will be removed so it will not be possible to swap languages as in the review.

And if you're wondering what the little hole is on the left of the keyboard in our pictures, it's where a LED will be inserted.

Acorn has confirmed that a sideways ROM facility will be provided in an expansion box which will be 'available shortly'. Included in this will be printer ports and games paddles. 'Expansion without tears' is how the company puts its.

There has been little reaction at Acorn to press reports of a computer price war.

Neither director was available for comment on whether there was any likelihood of a drop in the £199 tag quoted by Chris Curry. However, the suggestion in one paper of £120 was dismissed by a company spokesman.

Middlesex Poly summer sessions

SUMMER courses for beginners and enthusiasts on programming are being run by Middlesex Polytechnic.

Access to a mainframe as well as micros is included in a week's session costing £75, accommodation is extra.

Middlesex has built up a reputation for computer graphics, mainly based around the Picaso drawing system, and students will have access to this.

Contact the Admissions office, Middlesex Polytechnic, 114 Chase Side, London N14 5PN.

Atom newsletter

THE latest copy of the Atom User Group newsletter has just landed on our desk.

It includes articles on interfacing the Commodore printer, Wordpack, Amber 2400 printer (now defunct), BBC Basic board and Prestel.

The group is run by Peter Frost. See user group page for his address.

Experiment with transducers

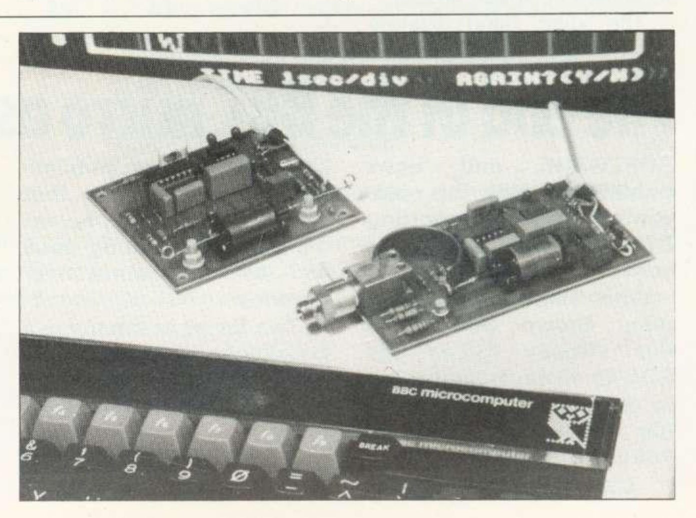
PRESSURE and displacement transducers for schools and industry now interface directly to the BBC micro through the analogue socket.

Three devices, two for displacement, are backed up with display software for pressure, velocity, weight and movement experiments (right).

The pressure transducer is based on a Bourdon tube and couplings can be provided for any type of size of tube. It covers PSI ranges 0-30, 0-60 and 0-200.

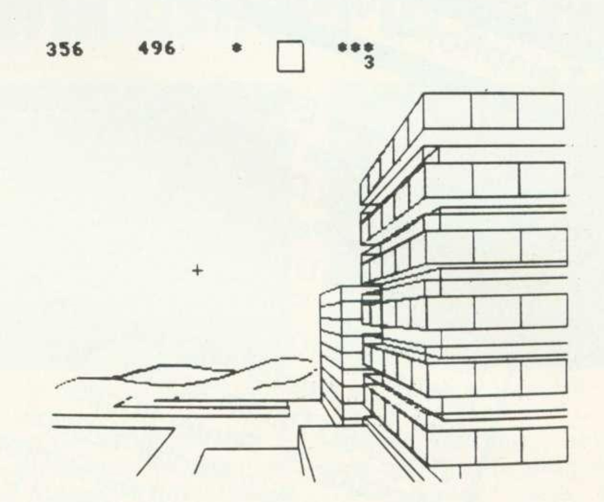
Movements of less than 1mm can be detected by the displacement devices, which have been designed for physics experiments such as Young's modulus, and Hooke's Law.

The makers, NTC Services, will write special software for customers. They're at 331 East Prescot Rd, Liverpool L14 2DD. Tel: 051-228 4690.



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BBC Soft Painting	8.99
BBC Soft Drawing	8.99
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Multitech MPF-11 64K	228.85
Torch Colour Computer	P.O.A.

RING FOR DETAILS ON OUR OTHER PRODUCTS

1 THAMES AVENUE WINDSOR BERKS

TEACHERS!

COME TO OUR SHOWROOM AND SEE ECONET IN ACTION

CARRIAGE FREE ON ALL ITEMS

ALL PRICES INCLUDE VAT

Programmable joystick duo

TWO programmable joysticks can be linked to the Beeb using a new adaptor box.

The system is designed so just one device can be connected to the analogue-in socket in the normal way, or two though an adaptor which interfaces the analogue and user ports.

The adaptor can also link one joystick and another device to the Beeb.

Each joystick has a keypad with 12 buttons, all but two of which can be programmed.

Voltmace, who make the system, provide programming notes on the system and are keen to see software written for it.

Each handset costs £10.95, and the adaptor box £13.95. Their address is Park Drive, Baldock, Herts. Tel (0462) 894410.

Basic on video

VIDEO tapes with integral software are being marketed to explain how to use the BBC micro and teach programming.

The three released so far each cost £19.95. The first is designed to help teachers in primary schools use and develop software. It includes two programs.

Programming is covered by the other tapes, which come with three or four programs. The software is downloaded from a video recorder onto audio cassette.

VHS and Beta versions are available from Vector Marketing, Denington Estate, Wellingborough, Northants. Tel: (0933) 79300.

Business spreadsheet in ROM

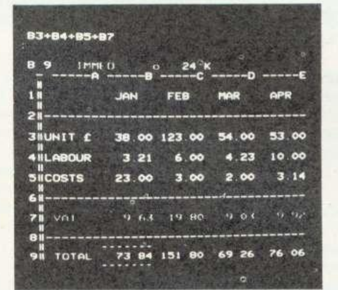
BEEBCALC – a ROM based spreadsheet program – is the follow-up to Computer Concepts' Wordwise. The £40 package is aimed at homes and small businesses.

A spreadsheet is really a grid of columns and rows showing items and figures. Beebcalc can have up to 99 rows and 26 columns – analogous to a sheet of paper. The screen view at any time shows a section of this 25 lines deep and either 40 or 80 characters wide.

And not only can the package display figure and statistics, but these can be translated into graphs and pie charts using an additional program supplied on cassette.

Once saved in ASCII format on disc or cassette, the display may then be loaded into a word processor. It can also be dumped to a printer.

The advantage of having Beebcalc in a chip is that it is immediately available



Screen shots of 40 and 80 character displays

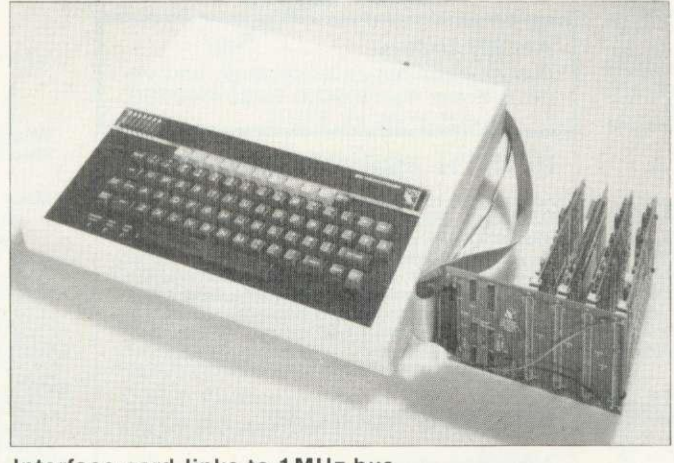
using the *ROM commands to replace Basic. Some of the ideas of Wordwise have been incorporated by Computer Concepts, such as the use of cursor and function keys.

Instructions for fitting the chip in the BBC micro's sideways ROM sockets are supplied, as is a manual and printed insert for the function key strip.

Two modes of operation are available – menu and display, each with their own set of commands. Escape switches between the two. All but one of the function keys are used to provide editing, cursor homing, justification etc. Twelve other keys are used, some in combination with shift and variables.

● At least one of the big High Street chains will stock ROM-based software. However, they are reluctant to encourage people to 'open the box' and insert the chips as they have no computer expertise and back-up.

Many dealers also unhappy about chain stores stocking BBC machines and firmware as they fear they will have to 'pick up the tab' when problems arise.



Interface card links to 1MHz bus

Bus interface to Eurocards

EXPANSION is the aim of Beebex – an interface card to link the BBC micro's 1MHz bus to Eurocards.

Control Universal says the device costs £49 and holds up to four cards, from their own Cube range or Acorn's.

A larger version designed for rack-mounting, costs £41 and will hold 14 connectors. Racks start at £72.

Applications include extra memory, analogue interfacing and digital input or output. Up to 1 Mbyte of paged memory can be addressed, or 256 bytes directly using the card.

Next on the company's agenda is a paged ROM to enable BBC Basic to talk directly to I/O devices. This should be available now.

School and pupils share profits from software

A SCHOOL in Essex aims to beat the software shortage by encouraging students to write software. It then shares any profits from the programs marketed.

Tabor High School has produced nine programs so far, for O and A level. The school markets the idea for the student, and is selling software at £2.50 and £3.50.

A further 12 ideas are at present underway aimed at exam revision in biology, and the school is set to distribute software for outside writers.

The first nine cover blood and circulation, digestion, heart, classification, heart and circulation, digestion and enzymes, breathing, photosynthesis and simulation of radioactive decay. All run on a model B.

Christopher Smith is in charge of the school project at Courtauld Rd, Braintree, Essex.

BBC SOFTWARE

GEMINI'S BUSINESS SOFTWARE

Written by professional Chartered Accountants and coded by competent programmers. Ideal for small and medium sized companies. Now available from stock.

CASHBOOK ACCOUNTS £52

One of the most innovative programs on the market. Replaces a manual cashbook system. e.g. Simplex and ALL-in One. The program is simple to use and will replace manual Cash & Bank records. Gives you access to vital management information as and when you want. It enables you to keep more positive financial control of your business.
The software is extremely well and lucidly documented. Gemini provide a full technical back-up and product up-date policy. The features include:
Summary of VAT information for VAT returns – Cumulative receipts and payments report analysed over the standard profit and loss and balance sheet headings – Options for departmental analysis of sales and purchases – Audit trail printout of all transactions – Journal routine for entering transfers between accounts and year end adjustment for debtors, creditors, etc. – Trial balance at any interval – Interfaces to Final Accounts program to produce balance sheet and trading and profit/loss account, etc.

FINAL ACCOUNTS PROGRAM £52

Requires Cash Book module. This program will take your cash book data to the logical conclusion of balance sheet, trading and profit/loss account and notes to the accounts i.e. Fixed Assets, land and buildings and capital accounts. Final accounts links to 'Beebplot' for graphic data presentation.

INVOICES & STATEMENTS £17.25

A complete suite of programs together with generated customer file for producing crisp and efficient business Invoices and monthly statements on your line printer. All calculations include VAT automatically and the programs allow your own messages on the forms produced. This program gives you superb presentation and saves time on one of the most tedious tasks in the office.

COMMERCIAL ACCOUNTS £17.25

A gem of a program. Daily Journal, Credit Sales, Cash Book, Credit Purchases, Other Purchases, Sales ledger, Purchase ledger, Bank accounts, Year to date summary. A fully interactive program suitable for all businesses. Files can be saved and loaded and totals from one file carried forward to another on cassette. Particularly useful from a cash flow point of view and immediate accessibility to totals for debtors and creditors. Bank
totally supported with entries for cheque numbers, credits and running balance.

MAILING LIST £17.25

A superb dedicated database to allow for manipulation of names, addresses and other data. The unique 'Searchkey' system gives you a further ten 'user defined parameters' to make your own selections. Feature includes the facility to find a name or detail when only part of the detail is known. It will print labels in a variety of user specified formats.

DATABASE £17.25

The program that everyone needs. The most valuable and versatile in your collection. Facilities include sort search, list print if required. Can be used in place of any card index application. Once purchased you can write your own dedicated database to suit your particular needs with a limitless number of entries on separate cassettes.

STOCK CONTROL £17.25

Dedicated software with all that is necessary to keep control of stock. This program will take the tedium out of stock control and save time and money. Routines include stock set up, user reference number, minimum stock level, financial summary, line print records, quick stock summary, add stock, delete/change record and more.

HOME ACCOUNTS £17.25

Runs a complete home finance package for you with every facility necessary for keeping a track of regular and other expenses, bank account, mortgage, H.P., etc. This program also allows you to plot graphically by Histograms your monthly outgoings.

BEEBCALC SPREADSHEET ANALYSIS £17.25

Spreadsheet processors have proved to be important tools for using micros in business, scientific and domestic financial applications. Without any programming knowledge at all, you may:-

- Set up a computerised spreadsheet, with chosen row and column names.
- Specify formulae relating any row or column to any other.
- Enter your source data and have the results calculated.
- Save the results on tape (or disc) for later reloading and manipulation.
- Print the tabulated results in an elegant report format.
- Access saved files and write own reporting or graphics presentation programs for the results.
- Ideal for anything that involves repeated re-calculation of results presented in tabular or spreadsheet format.

BEEBPLOT £17.25

Presents numeric and string data together in easily understood pie chart, histogram or graph format. Beebplot has a built-in interface to Beebcalc and the final Accounts program of Cashbook. The facility for mathematical function plotting and screen dumps for Epson or CP-80 printers is also provided. Gives superb results either from direct input of data from the keyboard or via simple access to other software data files. A must for business and education.

N.B. All the above prices are for CASSETTE based Software. For DISC based Software please add £3.00 per Software. When ordering please specify the type of diskette required (40 track or 80 track).

★ SPECIAL OFFER ★

During the months of June and July 1983 we are offering the following special discounts:

3 for the price of 2
5 for the price of 3
7 for the price of 4
(above discount does not include Cashbook and Final accounts)

Buy Cash Book & Final Accounts together and pay
ONLY £82.75

Access Orders
Just phone your order through and we do the rest. Tel: (0903) 50234/40588.

PLINTH FOR BBC MICRO

Protect your micro from the weight of the heavy TV/Monitor. This sturdy plinth is attractively finished in BBC colour. It can be used to support a monitor or a printer. The micro slides underneath comfortably. A must for every BBC Micro owner, specially for those who have to move/open their computer frequently.
Price: £11.95 (carr. £1.50)

BBC DFS MANUAL

A fully comprehensive disc manual for BBC Micros. All extra commands are included. A bargain at **£7.50** (no VAT).

WATFORD ELECTRONICS
CARDIFF ROAD, WATFORD.
Tel: (0923) 40588. Telex: 8956095

EDUCATION Software

JUNIOR MATHS PACK (32K) £6.95
Makes learning fun for 5-11 year olds. This package consists of 3 programs (menu driven) that increase in difficulty as your child becomes competent. A very good supplement to standard educational methods.

WHERE? £6.95
Do you know WHERE? you are? This well written program, using high resolution graphics offers timed tests on the geography of Great Britain.

WORLD GEOGRAPHY (32K) £7.00
Beautifully drawn Hi-Res colour map of the world illustrates and aids this graded series of tests on capital cities and populations of the world.

WORDHANG £7.80
(Age 7-13). A word guessing program based on the well known Hangman game. Uses full colour graphics. Complete with 260 words and the facility save your own list of words.

WORLDWISE £7.80
(Age 7-15. Two constructive geography programs allowing children to build detailed data bases covering both the UK and the world. Encourages children to refer to atlas and reference books. Save the database anytime.

ANIMAL/VEGETABLE/MINERAL £4.95
(Age 7-13). Provides an opportunity for children to teach the computer to differentiate between objects. The program tries to guess the object the child has thought of, using personalised responses like Mmm . . . I am thinking.

BRITISH GEOGRAPHY £6.95
Teaches a child the locations of Cities and Ports using directional keys.

CAROUSEL £5.50
Aimed at junior school age. Sequences of colours and sounds teaches a child to concentrate.

HAPPY NUMBERS £7.80
(Age 4-6). No reading skills are required to use this colour graphics number recognition and counting program. Children build patterns of flowers corresponding to figures, quickly learning their significance.

INTRO TO ARITHMETIC £10.45
4 programs – Additions, subtractions, multiplications and divisions. Help stage, moving graphics and colours. Worksheet produced at the end of program. (5-7 years old).

WRITING £5.50
Full screen demonstration of correct formation of lower case alphabetic characters. Several choice of sequence (5-7 years).

BEEB SPEECH SYNTHESISER

VERSATILE SPEECH SYNTHESISER UNIT FOR THE BBC MICROCOMPUTER

Watford Electronic's very own Speech System. Specially designed so that even a novice can make his BBC talk:-

SIMPLY the best! – An unlimited speech synthesis system. Complete with easy-to-follow manual. Controlling software is in ROM so no Cassette Loading problems!
PHONEMES for word synthesis – That means unlimited vocabulary! No extra speech dictionary chips to buy!
ENGLISH accent – Utilises inflexion techniques to produce highly comprehensible speech.
EASY to use system – Just plug the software ROM into a socket, the Speech unit into the User Port, and away you go! No specialised 'dealer upgrade' required!
COMPACT unit – The whole system is built into a small case – easily tucked behind the computer.
HOURS of fun! – Suitable for any application – Games, Educational Programs, Specialised Packages.

We know this all seems to good to be true but DON'T BE LEFT SPEECHLESS! Order your Versatile Speech Unit now!

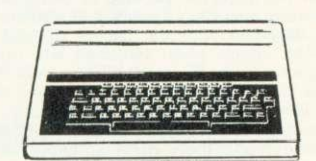
MAIL ORDER AND RETAIL SHOP. TRADE AND EXPORT INQUIRIES WELCOME. GOVERNMENT AND EDUCATIONAL ESTABLISHMENTS OFFICIAL ORDERS ACCEPTED. CARRIAGE: Unless stated otherwise, please add 60p to all cash orders. VAT: UK customers please add 15% VAT to the total cost incl. Car. SHOP HOURS: 9.00am to 6.00pm. Monday to Saturday. ACCESS ORDERS: Simply phone: Watford (0923) 50234.

WATFORD ELECTRONICS

CARDIFF ROAD, WATFORD, Herts, England

Tel: Watford (0923) 40588. Telex: 8956095 WAELEC

BBC MICROCOMPUTER



BBC Model A – £260
BBC Model B – £346

BBC Micro Model A to Model B UPGRADE Kits:

Upgrade your Model A with our Upgrade Kits and save yourself £ s s s

(Installation instructions supplied with every kit)

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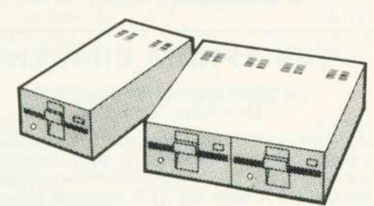
- BBC1 16K Memory (8 x 4816AP-3 100nS) **£16.00**
- BBC2 Printer User I/O Port **£6.98**
- BBC3 Disc Interface Kit **£85.00**
- BBC4 Analogue I/O Kit **£6.40**
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- BBC6 Expansion Bus Kit **£6.10**
- Complete Upgrade Kit Mod. A to Mod. B **£43.00**

Dust Cover for BBC Micro

(Protects your expensive Micro from foreign bodies)

£3.95

DISC DRIVES BBC COMPATIBLE



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- **MITSUBISHI** Slimline – Uncased, double density. Double track, 5¼", 1 Megabytes, track density 96TPI, track to track access time 3mSec. Plugs directly to BBC Micro. ONLY **£220**
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- Single Drive Cable for BBC Micro **£8**
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- ○ 10 Verbatim Diskettes, 5¼", S/S **£20**
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Attractive Continental designed, LOCKABLE Diskette Boxes. Strong plastic construction with lockable lid. Smoked acrylic top and cream base fitted with dividers and adhesive title strips for ease of filing.

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- 5¼" (holds 10) **£2**
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FLOPPY HEAD CLEANERS

Unless your office/home is dust free, you should clean heads at least once a week to avoid the risk of cross contamination.
Simply apply the cleaner to one of the specially formulated cleaning discs, insert into the drive and initialise. If your system has no initialisation program then insert the disc and open and close the door 5 times.

£22.50

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10" Tractor Feed, 80 columns, 30CPS Normal & Double width Char, Dot res graphics. Parallel Interface standard.

ONLY **£175** (£7 carr.)

SEIKOSHA GP250X:

10" Tractor Feed, 80 columns, 60 CPS, normal and double – width/height characters, 128 characters with true descenders in ROM, 64 user definable characters in RAM (384 bytes) Programmed printing (80 bytes of memory) for storing your own print sequences, dot addressable graphics with repetitive graphics data printing, RS232 and Centronics parallel interfaces standard, paper empty function and buzzer, self test routine. All this for

ONLY £235 (£7 carr.)

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IEEE	**£54.95**
PET	**£69.95**
APPLE II	**£69.95**
RS232	**£69.95**
BBC – Seikosha Cable	**£11.00**

DUST COVERS

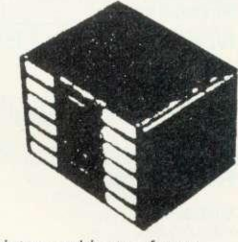
For SEIKOSHA GP80	**£3.75**
For SEIKOSHA GP100/250	**£3.95**

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For SEIKOSHA GP100	**£22**
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- Spare RIBBON for GP80 **£4.50**
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The unique computer program filing and storage system. Made of tough black plastic these compact drawer sections hold two cassettes each and lock together vertically to form miniature cabinets of any height. Each drawer section has two Agfa C12 Cassettes with labels plus external index card.
Five twin Paks (10 Cassettes) £6.00
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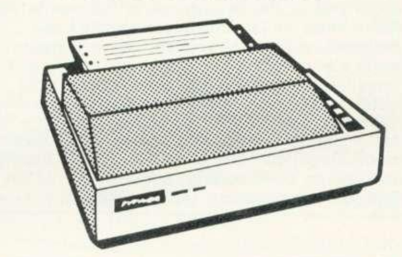
100 CPS, Bi-directional, logic seeking, 80 columns, 7x9 Dot Matrix head, true descenders on lower case, Superscript, subscript and underlining. Single sheet Friction or Tractor feed. Hi-resolution block graphics. All this for only

£320 (£7 carr.)

INTERFACES

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BBC – NEC Interface Cable	**£11.00**
RIBBON	**£6.90**
DUST COVER	**P.A.O.**

EPSON PRINTERS



Epson RX80

100 CPS, 9 x 9 matrix, dot addressable graphics, condensed and double width printing. Normal, Italic and Elite Characters. Tractor feed, 10" max width, bi-directional, logic seeking. Centronics Interface standard.

ONLY £285 (£7 carr.)

Epson FX80

160 CPS, 11 x 9 matrix, proportional spacing, superscripts, subscripts, dot addressable graphics. Normal, Italic and Elite characters. Up to 256 user definable characters. Down loadable character set. Condensed and double width printing. Full proportional spacing. Four user defined margin positions. Tractor and Friction feed. 10" maximum width Bi-directional, logic seeking Centronics interface standard.

ONLY £388 (£7 carr.)

Epson MX100

136 columns, 15" carriage, Tractor and Friction feed, 9 x 9 matrix. Speed 100 CPS, Bi-directional logic seeking. Normal, Condensed and Enlarged Characters. Also Emphasised, Double and Underlining modes. Hi-res bit image graphics. Superscript and subscript. Centronics Interface standard.

ONLY £425 (£7 carr.)

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RS232	**£38.00**
RS232 plus 2K Buffer	**£75.00**
IEEE 488	**£70.00**
Parallel 2K	**£62.00**

MX100 PRINTER

RS232	**£40.00**
RS232 plus 2K Buffer	**£60.00**
IEEE 488 (Interface Board)	**£43.00**
PET Cable	**£20.00**
BBC – Epson Interface Cable	**£11.00**

RIBBONS

MX80 FT	**£4.75**
MX100	**£10.00**
FX80	**£4.75**
RX80	**£4.75**

DUST COVERS

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MX100	**£5.25**
FX80	**£4.95**
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8½" x 9½" Fanfold paper plain or ruled (1000 sheets) **£7** (£1.50p carr.)

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Top quality Slimline, portable Cassette Recorder for Computer use. Mains/Battery, operated with counter.

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CASSETTE LEAD

For our Cassette Recorder to BBC Micro **£2.00**

C12 Computer Grade **CASSETTES** in library cases. **40p**

BEEBPEN

(BBC Wordprocessor in 4K ROM)

BeebPen has been written completely in machine code for the BBC Micro to facilitate maximum speed and number of functions. It is without doubt one of the best things to happen to BBC Micro since its launch. BeebPen has been designed to be as simple to use as possible while still retaining the maximum power and versatility. Numerous functions include right justification, block operations, text compression, full cursor control with on screen editing, a full set of printer options and editing in 80 column mode. BeebPen ROM plugs into one of the ROM sockets, no track cutting required.
Special Introductory Offer: £32.00

MONITORS



MICROVITEC 1431
14" Colour Monitor, RGB Input. (as used in BBC programmes) FREE Interface Lead. **£249** (carr. £7)

Interface Lead for Sanyo **£8.**

ZENITH 12" Green Monitor. Hi-resolution **£75** (£7 carr.)

MISCELLANEOUS CONNECTORS

	Plugs	Sockets
RGB (6 pin DIN)	**30p**	**45p**
RS423 (5 pin Domino)	**30p**	**40p**
Cassette (7 pin DIN)	**25p**	**65p**
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Paddles (15 pin 'D')	**£1.10**	**£2.15**
Disc to BBC Power Plug 6pin	**70p**	
Disc Drive Power Plug 4pin	**60p**	

BEEB PLOTTER

Watford Electronics' BEEBPLOTTER will work with 32K BBC Micro. Connects to Analogue port. The unique design makes it accurate and simple to use. The comprehensive booklet supplied, describes its use in details and shows some of the possible applications.

The special features include:-

* Works in all graphics mode and any colour selectable.
* Commands printed on Tablet and On-screen instructions.
* Special routines enable pictures to be quickly loaded from tape.
* Works with all operating systems and ECONET. Tape and Disc versions available.
* Large drawing area (32cms x 23cms).
* Maps, Pictures and Diagrams produced quickly and easily.
* Transparent tablet enables maps and diagrams to be copied directly from books.
* Commands include line, circles and rectangle drawings, infilling, full editing and an easy to use copy and move feature.
* Screen dump routines included for Seikosha and EPSON printers.
* Routines are included to allow user to incorporate pictures in their own programs.
* Designed by a professional teacher with educational uses in mind.

ONLY £59 (£3 carr.)

EPROM PROGRAMMER for BBC MICRO

At last! – the EPROM Programmer for BBC Micro Computer from WATFORD ELECTRONICS that will suit both your pocket and all your requirements. Programs all popular types of EPROMS from 2K bytes up to 16K bytes – **2764 — 2516 — 2532 — 2564 — 2764 — 27128.**
This extremely powerful system is designed for your needs of TODAY & TOMORROW! – BBC Basic programs can be copied into EPROM and subsequently re-loaded faster than from a disc! Suitable for both hobbyist and professional users!

Just look at these features:

● **COMPLETELY SELF CONTAINED** – Housed in its own sturdy case – Uses its own Power Supply – Connects directly to the 1MHz Bus – Simple and Safe!
● **FULL SOFTWARE SUPPORT** – Comes complete with simple to use ROM based software – Facilities include Varification, Reading, Virgin Testing, Writing, Editing, Saving, Loading and more! NOTE!! – This software does NOT simply comprise hastily prepared routines to get you going, but is a professional, purpose designed applications package.
● **ACORN BUS COMPATIBLE** – Use of the 1MHz connection complies with all Acorn addressing recommendations – That means you can still add-on such things as the TELETEXT, IEEE 488 and PRESTEL Adaptors without having to disconnect everything.

You don't need just any Eprom Programmer – you need **WATFORD ELECTRONICS** EPROM PROGRAMMER System.

★ Introductory Offer ★

ONLY £65 (£2 carr.)

Price includes software in ROM and Manual)

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CASSETTE LEADS 7 pin DIN Plug to 5 pin DIN Plug + 1 Jack Plug	**£2.00**
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to 7 pin DIN Plug	**£2.50**
to 3 Jack Plugs	**£2.00**
6pin DIN to 6 pin DIN Plug (RGB)	**£2.50**
Monitor Lead, BNC to PHONO	**£3.00**

BBC LIGHT PEN KIT

All parts available as per Acorn User's 'SHINE A LIGHT' Light Pen article.
Kit Price: **£9.95**

BBC JOYSTICKS

Two versions available:

SINGLE: Player type **£7.00** each
TWO Players type **£11.50** per pair

PRINTER LEAD 36"

Ready made printer lead to interface BBC Micro to EPSON, SEIKOSHA, NEC, etc., Printers.

ONLY £11

13 ROM SOCKET BOARD

Are you wondering where to fit new ROM based software inside your computer in addition to the BASIC, WORDPROCESSOR, DFS, and FORTH ROMS? Then our add-on 13 ROM Socket Board is the answer. Simply plugs into one of the four ROM sockets currently available in BBC Micro. There are only 4 solder connections to be made. Full instructions are supplied.
Our 13 ROM SOCKETS BOARD enables the User to increase the Sideways ROM capacity from the basic four sockets on the main board upto the full SIXTEEN capable of being supported by current operating systems. In addition the board is designed with the facility to hold upto 16K RAM, which when switched into operation is automatically selected by any WRITE signal to the Sideways ROM area. This gives the User the ability to write a utility or language and upon pressing break have the utility or language up and running (new ROM software can be developed and tested in situ.)
The Board gives the User, plenty of freedom to explore the possibilities of the new paged ROMs due in the coming months and offers them the chance to develop their own.
All essential lines are buffered and the Board meets or exceeds all timings for operation in the BBC Microcomputer.

Supplied ready-built and tested

ONLY £35 (carr. £1)



Watford Electronics' own

BEEBMON

A ROM based machine code Monitor for the BBC Micro. It enables machine code programs to be debugged and altered easily and quickly. Being a ROM, its Commands are always readily available and occupy no USER memory.
The special features includes facilities like: TABULATE, MODIFY, FILL, COPY, COMPARE, SEARCH (Hex & ASCII), CHEKSUM, DISASSEMBLE, RE-LOCATE, SINGLE STOP, SET BREAK POINTS, SCREEN DUMP ROUTINE, DUMB TERMINAL and many more facilities.

Introductory Offer: £18

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* New Broom for EPROMS *
* TEX Erasers Sweep Clean *

EPROMs need careful treatment to survive their expected lifetime. Rushing it could burn their brains out. So cop-out of this helter-skelter world; take it easy the TEX way and give your chips a well earned break. Cool, gentle and affordable. EPROMPT does it properly.

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(SOLID STATE ELECTRONIC TIMER)

EPROM Erasers need just half an hour to finish their job. It is the proper erase time for all EPROMs. While the Eraser is busy you may take a break but not for too long without our TIMER on the job. Over erasing can shorten data storage time. TEXTIMER will remember to switch off the lamp and your chips will forget nothing new. TEXTIMER will pay for itself in no time.

ONLY £15.00

★ *SPECIAL OFFER* ★

EPROMPT EB plus TEXTIME – ONLY **£42**

EPROMPT GT plus TEXTIME – ONLY **£48**

EPROMS for BBC MICRO

	1+	25+
2764-250nS	**£3.95**	**£3.50**
27128-250nS	**£23.00**	**£19.95**

EPROM PROGRAMMING SERVICE

We now offer a 'while u wait' EPROM copying service (24 hours on Mail Order). Just bring along the EPROM to be copied (we can supply any type of EPROMs at unbeatable prices) and while you wait, we shall copy, test and varify the copied EPROMS.

Copying Charge **£2.00** per chip

(Quantity discount available)



BBC MICRO DFS
by
Watford Electronics

This new DFS is fully compatible with ACORN DFS and has many more features.,

The extra features include:

- Optional Double Directory (gives 62 Files per side)
- 40 Track disc can be read on 80 track drives (software switchable)
- Workfile saves typing of Filenames.
- All Format and Varify commands ROM resident, so no costly utility disc needed.
- Special Commands are included to ease transfer of Cassette programs to disc.
- Optional – Copy command available.

Price: DFS ROM only **£42**
Complete DFS Kit **£85**

(P.S. We shall exchange your existing Acorn DFS ROM for this highly superior Watford's BeebRom for £35).

BBC GAMES SOFTWARE

(BUG-BYTE)

SPACE PIRATES	£6.95
SPACE WARP	£7.80
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DRAGON QUEST	£10.00
FRUIT MACHINE	£4.75
CITY DEFENCE	£6.75
MULTI-FILE	£8.75
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ASTEROID BELT	£7.80
CHARACTERS	£5.80
HITCH-HIKER	£5.95
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ADVENTURE	£6.95
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GOMOKU	£4.95
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SEEK	£5.95
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ZOMBIES	£4.95
GALACTIC COMMANDER	£6.95
MICRO BUDGET	£7.95
ROULETTE	£6.95
SPACE MAZE	£6.95
KILLER GORILLA	£6.95

Wordwise

WORDWISE Model B
Without doubt the most sophisticated piece of software yet written for the BBC Micro. Wordwise contains all the usual word processing features enabling characters, words, sentences or any defined section of the text to be deleted, moved or copied from one part to any other part of the document. The more complex facilities such as search and replace or file handling commands are menu driven so that even a beginner can understand how to operate them. Wordwise will work with whatever filing system is currently implementated. Supplied with full fitting instructions and a spiral bound manual. We believe this word processor compares favourably with those costing many times as much.

Special Offer – **£34**

LOGO II
This language is very popular in American schools as it is an ideal educational program. It can graphically demonstrate the ideas of defined procedures, sub-routines, loops and even recursive programming. Gives excellent introduction to LOGO language for young and old alike. **£9.95**

FORTH ROM for BBC

This superb compiling language now available in ROM. Simply plugs into one of the ROM Sockets. **£35.00**

Full FORTH Manual **£6.75**

LOGO in ROM

This popular language now available in ROM. Manual included with the ROM.

PRICE: £36.00

APPLICATION SOFTWARE

CONSTELLATION (32K) **£6.50**
The great Bear! The Southern Cross! The Horned Goat! See the night sky gloriously depicted in hi-res graphics. Constellation has been adapted and enhanced from our successful ATOM program.

DISASSEMBLER (16/32K)
The most powerful, flexible and easy to use Disassembler currently available for the BBC Micro. Has 5 modes of operation from memory dump to full automatic disassembly – ability to identify any location in memory with a label – operating system entry points and indirection vectors are already labelled when the Disassembler is loaded – ability to define a 'map' of up to 72 separate areas of machine code – output may be directed to the screen or a printer – areas of code can be disassembled and output saved on tape or disc in BASIC EXEC format for later incorporation into user programs – Machine-code programs may be loaded and disassembled regardless of their actual run-time location – the current set of labels, map and associated data may be saved at any time on tape or disc. This data can be reloaded at a later date and disassembly continued – full error checking and reporting is carried out at each step – disassembler operated by typed commands or the user definable user keys – full instructions are supplied in the form of a 'HELP' program – available on Cassette or Disc.

Cassette £6.90
Disc S/D £9.90
Disc D/D £9.95

EMULATOR **£6.95**
An extremely powerful and flexible Cassette based machine code interpreter from Simonsoft. Treats machine as a 'high level' language and is in many ways analogue to BBC's built in BASIC Interpreter. it can therefore be used as a Monitor, Disassembler, Assembler and 'Peeko' Computer.

Filer **£8.95**
A powerful file handling program for BBC FILER allows the user to build up, manipulate, store and retrieve data on the BBC. A very powerful package indeed.

ONLY THE BEST AT WATFORD

Computer Concept's Firmware

BEEB-CALC **£34.00**
A ROM based spreadsheet program, like wordwise this firmware is fast and simple to use – yet is a powerful spreadsheet analysis program, considerably better than the original 'calc' program – full floating point maths. Works in 40 or 80 column screen modes – variable column widths. Works with either cassette or disc. This ROM coupled with Wordwise can turn your micro into an ideal small business machine.

DEBUGGING PROGRAM **£19.00**
A machine code program. Essential for the machine code programmer. An ideal complement for the assembler built into the BBC machine. Contains a full machine code monitor allowing examination and alteration of memory, registers, setting of break points and even single stepping through machine code programs.

DISC DOCTOR **£19.00**
This ROM contains useful disc utility programs. Enables recovery of any data off the disc including deleted files etc. The full disc editor allows the alteration of any bytes directly on the disc (or in memory), or the loading and saving of any track or sector on the disc. Automatic transfer of programs from tape to disc and vice versa. Also includes a whole host of other useful utilities – string search, function key editing, the ability to format 35, 40 & 80 track discs.

PRINTER TOOL-KIT **£19.00**
This ROM includes routines for high resolution screen dumps for both the EPSON and NEC printers. Will work in any graphics mode with automatic grey shading of all screen colours. The most useful feature of this program is its 'spooling' capability. This enables data such as a program listing of high res screen dumps to be automatically spooled from your disc to the printer while using your BBC machine for running other programs.

★ SPECIAL DISCOUNT OFFER ★
We allow a special 10% discount on all the above four Firmware when purchased with our '13 ROM Socket Board'.

BOOKS
(No VAT on Books)

30 Programs – BBC Micro	£4.95
30 Hour BASIC (BBC Micro)	£6.00
6502 Application Book	£10.25
6502 Assembly Lang. Programming	£12.50
6502 Assembly Lang. Subroutines	£11.80
6502 Software Design	£10.50
ACORN ATOM Magic Book	£5.50
Advanced 6502 Interfacing	£10.95
Assembly Lang. Programming for BBC	£8.95
BASIC Programming for BBC Micro	£5.95
BBC Micro DFS Manual	£7.50
BBC Micro Revealed	£7.95
BBC Micro Instant Machine Code including Software Cassette	£34.00
Creative Graphics on BBC Micro	£7.50
Discover FORTH – Osborne	£11.25
Easy Prog. for BBC Micro	£6.50
Further Prog. for BBC Micro	£6.90
FORTH Programming (Sams)	£12.50
Getting Acquainted/Acorn ATOM	£7.95
Graphs & Charts on BBC Micro	£7.50
Intro to Micro Beginners Book (3 Ed.)	£9.90
Let your BBC teach you to program	£6.75
Micros in the Classroom	£4.90
Practical Prog. for BBC & ATOM	£5.95
Programming the 6502	£10.75
Mastering VISICALC (Sybex)	£11.95
Structured Prog. with BBC BASIC	£9.50
The BBC Micro An Expert Guide	£7.90

GENERAL SOFTWARE

JUNIOR MATHS PACK (32K) **£6.95**
Makes learning fun for 5-11 year olds. This package consists of 3 programs (menu drive) that increase in difficulty as your child becomes competent. A very good supplement to standard educational methods.

WHERE **£6.95**
Do you know WHERE you are? This well written program, using high resolution graphics offers timed tests on the geography of Great Britain.



Free bulletin board service for hobby micros

A NETWORK of nine free bulletin boards has been set up for micro users to exchange information.

With a modem and suitable software, messages can be posted and retrieved on subjects such as hints, items for sale, wanted, personal – and there is a software library. The system is geared towards hobbyists, and the boards are supported by computer groups, retailers and hobbyists.

Although each is individual, the communication protocol is standard, and runs through the RS232 interface.

If you have terminal software and modem, set up the serial port at 300 baud, word length 7, parity even and stop bit 1. Once on the system, a help command is available – but don't just hang up at any time as this can have nasty results!

The Association of Free Public Access Systems is made up of nine bulletin boards.

Details from Frederick Brown, Forum 80, 421 Endike Lane, Hull HU6 8AG. Forum 80 can also provide terminal software for the BBC micro.

News in brief

THREE primary programs are the first fruits of a liaison between Longman and Ladybird publishers. *Rally* covers maths, *Terrible Tales* reading and size-estimation, while *Sheepdog* encourages problem-solving and compass work.

The packs are £9.95 each (+VAT). Other programs on maths and English are planned for September.

BRISTOL University wants to hear from people who would be interested in attending weekend programming courses. Contact David Wilde, Extra-mural studies, 32 Tyndall's Park Rd, Bristol BS8 1HR.

EDUCATIONAL publisher Ward Lock is to distribute and market Chalksoft products for the BBC micro. These include *Punc-man* and *Nosher* on punctuation, *Letters* and *Capitals*. The company will give demonstrations in schools.

PUFFIN are sponsoring a national programming competition to find original software and games. The company also plans to release *Micro Games*, a book of listings, in August.

TRANSFORMERS to filter out mains spikes and interference are made by Cetromic Components in Ware, Herts.

The company claims to guarantee a 'clean supply', no matter what the type of disturbance. Tel: (0920) 871077.

Software on the radio

RADIO stations all over the country have taken computers to their hearts. Many carry weekly features, while several have already broadcast software.



Bristol's Radio West send out software over the air each week using two methods. Some goes out during *Datarama*, but most is broadcast when the station closes down at 1am with the channel's identification code every 15 minutes.

The longest program ran to 17 blocks and took 35 seconds. Listeners can download listings during the show to look at as they listen.

Presenters Tim Lyons and 'The General' can be heard on Monday evenings, and write most of their own software (Tim has a BBC micro).

In Leeds, the local BBC station has a fortnightly slot on Tuesdays at 6.45 called Abacus. It started when a local user group approached producer Jennifer Bowen with the idea last summer. She trained them up and they still write most of the show.

Software for eight machines has been broadcast, mainly graphics and special messages.

Radio Brighton also has a fortnightly Tuesday programme lasting 20 minutes. London's Capital Radio is also developing a BBC micro system to use in its studios.



Teacher study packs from AU

SELF-STUDY packs on micros are available for teachers from the Open University.

The first two – Awareness Pack and Educational Software – have been produced for the BBC micro and include software. The second is to help teachers with experience evaluate software.

Details from: Project Manager, Micros in Schools Project, Open University, Milton Keynes.

Author in action

HINTS and tips author Joe Telford is one of the guest speakers at a user group lecture in October.

He will give a survey on educational software in primary and special education to Norwich and District BBC Micro User Group.

This will be followed up at the same group by a talk from Chris Pointer and Diana Thomson in November.

Paul Beverley runs the groups and meetings are held at Norwich City College (see User Group page).

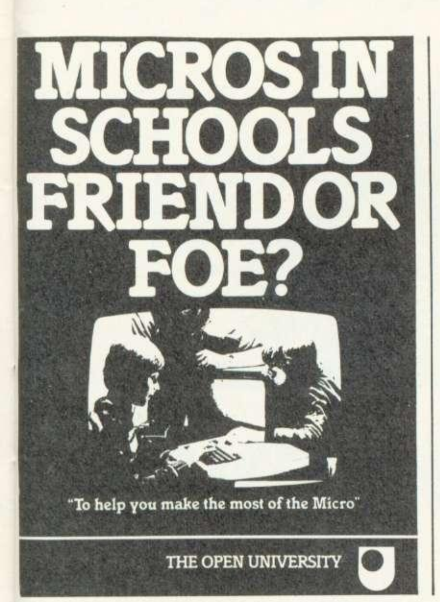
● Our apologies to Rob Alecio of Oxford who was uncredited in the July issue. 'Passing array variables' was his article, but the covering letter somehow disappeared.

Software makes graphics easy

DRAWINGS on the BBC can be produced using Easy Graphics – a package from Hexagon Software priced at £13.50.

Circles, colour filling and mixing, rubber-band line drawings, screen saving are all provided, as well as repeat function.

The package is designed for non-programmers, and includes a manual, demonstration program and program generator. Tel: Dudley (0384) 232992.



VAT program and game

BUSINESS software to help cope with VAT returns and invoicing from Understanding Ltd has been converted for the Beeb.

Vatkeeper takes the slog out of filling VAT form 100 while *Invoicer* calculates VAT and discounts, produces invoices and customer sales histories. Prices for these systems range from £50.

A management training game, *Corplan*, suitable for A-level upward also has a BBC version.

The products are aimed at schools and small businesses and come with documentation.

Understanding Ltd are at 100 Cricklewood Lane, London NW2 2DS. Tel: 01-450 1144.

● Adventure-Zone Software specialises in you-know-what and hopes to provide an advice service and pass tips to and from players. Write to 10 Ennis Close, Harpenden, Herts AL5 15S for details.

Junk speciality

THE Computer Junk Shop in Widnes specialises in second-hand and obsolete equipment.

Chips, printers, components, boards and even BBC micro keyboards have been seen to pass through their hands at computer shows. If you're ever crossing Runcorn Bridge, they're five minutes away at 10 Waterloo Rd. Tel: 051-420 4590.

MUSE celebrates its first decade this month

MUSE celebrates its tenth year this summer at its annual conference.

The group exists to help teachers and schools with every aspect of micros, and many of its leading members are now household names in the computer world.

Planned speakers at the conference include John Coll of Acorn, Roy Atherton author of *Structured Programming with BBC Basic*, Eric Deeson, Bob Trigger of Five Ways Software and Colin Wells of ITMA.

Paul Bond a member of the design team for the BBC micro's operating systems will be talking on the subject.

Telesoftware, timetabling, music, the BBC Buggy, networks, Logo, interfacing and persuading teachers to write software will also be covered.

The conference takes place at Nottingham University on July 25–27. Membership details are available from the membership secretary at MUSE, Freepost, Bromsgrove, Worcs. B61 7BR.

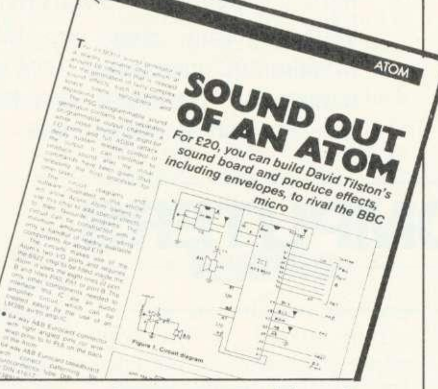
Atom winner

ATOM user David Adams has won first prize in a schools computing competition.

His program sets up multiple device tests on any subject and analyses the answers given by pupils. Although written for an Atom, the software has now been converted for a Beeb.

David's reward was £100, with a further £200 going to his school. He is a member of the Manchester Acorn User Group, and is just turned 16.

PCB for Atom sound generator


ATOM

SOUND OUT OF AN ATOM

For £20, you can build David Tilston's sound board and produce effects, including envelopes, to rival the BBC micro

Figure 1. Circuit diagram

ATOM users – upgrade your machine to produce sound effects that will rival those of the BBC micro by adding a sound generator. The May issue of *Acorn User* explains how to interface a sound board based around the AY38910 programmable sound generator chip.

The printed circuit board to accompany the article costs £5.38 (inclusive) and is available from: Electro Technical Services, 55 Raymond Road, Hellesdon, Norwich NR6 6PN.

Interface box for BBC micro

INTERFACING

Having covered 1 MHz bus theory, Paul Beverley gets down to practice

INTERFACE BOX FOR THE BEEB

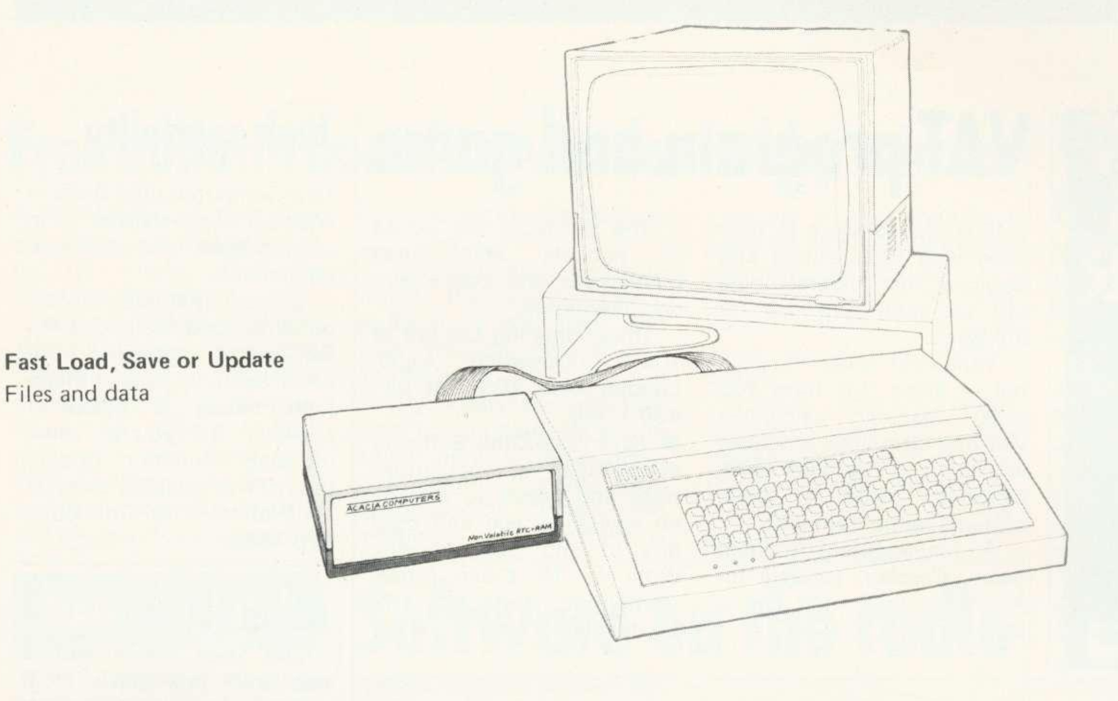
INTERFACE your BBC micro with a specially-designed interface box outlined by Paul Beverley in *Acorn User* (see May's issue for the design and June's for how to test it). For £11.95 we can provide a double-sided printed circuit board with plated through holes, and component overlay.

A kit of parts, as well as fully-built and tested boards is also being made available (should cost about £80 for completed interface box). These prices include UK postage and VAT. Please allow 28 days for delivery.

Make cheques payable to Electro Technical Services at 55 Raymond Road, Hellesdon, Norwich NR6 6PN.

DO YOU HAVE TIME FOR YOUR COMPUTER? DOES YOUR COMPUTER HAVE TIME FOR YOU?

Fast Load, Save or Update
Files and data



Remember!
Appointments
Pay credit card
Birthdays
Passport renewal
etc.

ACACIA COMPUTERS' NON-VOLATILE RTC + RAM WITH ROM SOFTWARE PROVIDES BBC MICRO USERS WITH A SOPHISTICATED ELECTRONIC DIARY SYSTEM, AS WELL AS A FULLY FUNCTIONAL FILING SYSTEM.

DIARY

The diary has many automatic features such as reinserting regular reminders. Reminders are displayed on power-up or at a preset time. It has a real-time clock and calendar which do not need to be initialised on power-up. The alarm mechanism is operational when the computer is used in virtually all modes, unlike other diary programs.

FILING SYSTEM

Enables you to save programs, soft key strings, power-up initialisation, etc. Includes many features: wild-card filename search, file manipulation, automatic compact, dating of files etc. etc.

EXPANDABILITY

Extra memory expansion will be available later from ACACIA. The box supplied is large enough to house these extra memory cards.

FEATURES

- Powered from BBC micro and has an extra socket for powering disc drives or other peripherals.
- Alarm output for switching other equipment at a preset time.
- Battery guaranteed for 3 years (typical life 6 years.)
- Easily installed: plugs into 1MHz bus, ROM fitted in BBC micro paged ROM socket.
- Contains 4KBytes CMOS static RAM.
- Complete with full instructions.

ACACIA COMPUTERS



ORDER FORM

To ACACIA COMPUTERS LTD.,
5 Coombe Lea, Bickley, Bromley, Kent, BR1 2HQ.
Tel: 01 - 467 5189

Please send me. Non-volatile RTC + RAM diary/filing systems at the special introductory offer price of £128 + VAT each (£149.90 inc. VAT post and packaging).

I enclose Cheque/Postal Order for. payable to ACACIA COMPUTERS LTD.

Name . . . .

Address . . . .

. . . . .Postcode . . . . Telephone . . . .

Signature . . . .

Please allow 28 days delivery

N.B. Requires BBC micro model B fitted with version 1.0 operating system, or later.



Micronet and Beeb make news

Bill Penfold reports on developments which could revolutionise reporting

IT SEEMS daft. Journalism is supposed to be about communication – conveying facts and comments, news or ideas, as quickly and as simply as possible. But while satellites link the world in seconds, much of British journalism seems to have got little further than the age of the quill.

True, most of us hacks have managed to learn to use a telephone and as long as the copytaker on the other end is not totally dyslexic it is usually possible to get the story across. But oh, the struggle!

Like Robert Redford in *The Candidate*, a typical reporter as he bellows down a crackling phone line can be heard to mutter 'There must be a better way . . .'

Maybe though – thanks to a BBC micro and Micronet 800 – there is a better way . . . and one which promises soon to get even better. For with a little encouragement plus a bit of firmware, ordinary Beeb micros could be pioneering a new, important area of journalistic news gathering.

Now before anyone points out that there are already dedicated word-processors designed for semi-dedicated hacks to pump copy straight into their newspaper's computers, let's examine the present position.

Probably it was a little harsh to claim British journalism is still clinging to the quill as there are one or two papers feeling their way into the late 20th century.

The news agency Reuters for instance is beginning to supply its reporters with dedicated machines incorporating a small monitor and an acoustic coupler for filing from conferences. A few provincial papers – the *Wolverhampton Express* and *Star* and *Portsmouth Evening News* have also introduced or are beginning to bring-in 'direct input'. But they are few and far between, and their systems are also pretty expensive – especially if they need a mini at the other end.

So until now, computer-transmitted copy, was not a viable prospect for most papers. But there is an experiment underway which could bring copy to your local High Street gazette or chronicle long before it gets to Fleet Street.

Venture

The experiment involves my BBC B, Prestel and a couple of medical newspapers based in Guildford. The two papers are *Doctor*, sent each week to every GP in the country, and its sister publication *Hospital Doctor*.

Though based out in the sticks the *Doctor* papers are go-ahead in the crowded and competitive world of medical journalism and earlier this year began a new venture with a Prestel magazine (Page *27634).

My problem, as the papers' parliamentary correspondent is ensuring that copy sent later in the week arrives in time for the final Friday deadline. Stories sent by post on Mondays or Tuesdays usually arrive well ahead, but from Wednesdays on it was never certain they would be on the news editor's desk when needed.

But with their Prestel magazine, the two medical papers naturally had a Prestel terminal, and with the advent of Micronet, providing access to Prestel's mailbox system seemed to be part of the answer.

At Prestel the idea was taken-up with interest. A special pre-addressed Mailbox page was set up for me on the Enterprise computer. (Eventually every Prestel computer will be linked to Mailbox.)

It was a start. But the major problem was, and still is, that you have to be 'on line' to Enterprise the whole time.

Now that is no problem for sending one or two frames, but two or three news stories, each between 250 and 700 words, can keep you on line for a long time.

The answer is to be able to tap in the copy off line, save it as files on disc or tape and then input when on line to Prestel. That is not possible on the present software. But a new ROM promised by Micronet will, so it is claimed, enable you to do that for about £11.

Coming about the same time is a development which probably is even more significant. Micronet is planning to bring out an inexpensive hard-wired single chip modem as an alternative to the acoustic coupler. This will plug straight into the computer and a phone jack.

The importance of this is that the BBC could be equipped with a variable baud rate modem.

And that opens up the possibility of micro speaking to micro. The present acoustic coupler has a read rate of 1200 but an output rate of only 75. The variable baud rates of the modem should be read and output both at 1200 – for £60.

Question

It should also mean that on a standard home computer such as the Beeb it will at last be possible for every local paper with a branch office in a neighbouring town to be able to afford its own 'wire' service. Or for ordinary journalists, writing for a number of different publications, to be able to write copy on a micro and then 'phone it in.'

One question mark over the suitability of the Beeb is the standard of its keyboard. This may surprise users who compare it with the touch boards of Sinclairs and Atari 400s or the dead skin feel of the Spectrum. But for long-term typing of copy, the BBC's keyboard could do with an up-grade. It's surprising no one has yet come up with one.



IBITOR NEWS . . . EXHIBITOR NEWS . . . EXHIBITOR NEWS . . . EXHIBIT

A NON-VOLATILE RAM filing system and electronic diary, supported by comprehensive software in a sideways ROM will be demonstrated by **Acacia Computers.**

The filing system is an addition to the existing range (Disc, Econet, etc.) with all the advantages of static RAM (fast access, no moving parts, immunity to dust, etc).

A typical application will be to automatically return the computer to the state it was in before being switched off. For example, the user softkey strings, screen mode and character definitions can be reinitialised, the user port re-enabled and programs reloaded.

The electronic diary takes much of the work out of keeping a diary. For example, a reminder can be set to automatically occur at regular intervals, from 31 minutes to 31 years. It can inform you of the day's appointments, with messages of any reasonable length; either immediately the computer is switched on, or at preset times.

Of course, the diary software never needs to be loaded, and the alarm system is operational while the micro is used for entering and running programs, word processing, etc.

The filing system/diary unit has its own clock/calendar which keeps time even when the computer is switched off.



* * *

THREE new **NEC** programming courses will be on show: Beyond Basic, Structured Basic, and Interfacing and Control on the BBC Micro. Software displays will include All Fingers Go! – the NEC's fast typing course. Users will be guided through all NEC's offerings – including 30-Hour Basic – by special software.

* * *

THE **Computer Bookshop** will offer the best selling books for all popular home computers, including BBC and Acorn.

Titles from 35 US and UK publishers will be on display.

* * *

THE official BBC carrying case will be on show this the first time at the Acorn User Exhibition.

Manufactured by **Intastor Micro Aids** in tough, good looking, durable fibre board, the case is designed to accommodate the micro with separate compartments for leads, cassette player, and handbook.

This is the latest addition to a growing list of BBC micro support products which also include the official BBC programmers' Kit (on sale at a specially reduced price of £12), two sizes of print-out binders and a programmer's grip binder.

* * *

MICRO-AID aims to help people understand how to use the micro by giving 'aid'.

The company switched all its efforts to the Beeb in 1982.

All the software costs less than £14 and in some cases as low as £1. The range includes utilities, games, education and business programs as well as hardware such as Epson printers and Teac disc drives.

* * *

AN EXPANDABLE console will be on show from **Silent Computers.**

It houses the BBC micro plus disc drives with the VDU on top, or BBC micro plus drive plus second processor or teletext adapter. All interconnecting wiring is kept out of sight within the console.

Coming soon is a matching bolt-on module, allowing the console to grow with your needs.

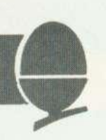
Micro owners who only need a VDU stand will find one to slip over the BBC and allow adequate ventilation. The stand acts as a dust cover when the micro is not in use. The console can be fitted with a hidden bracket, making a very good thief deterant.

EXHIBITORS booked in so far

Acacia Computers
Acorn Computers
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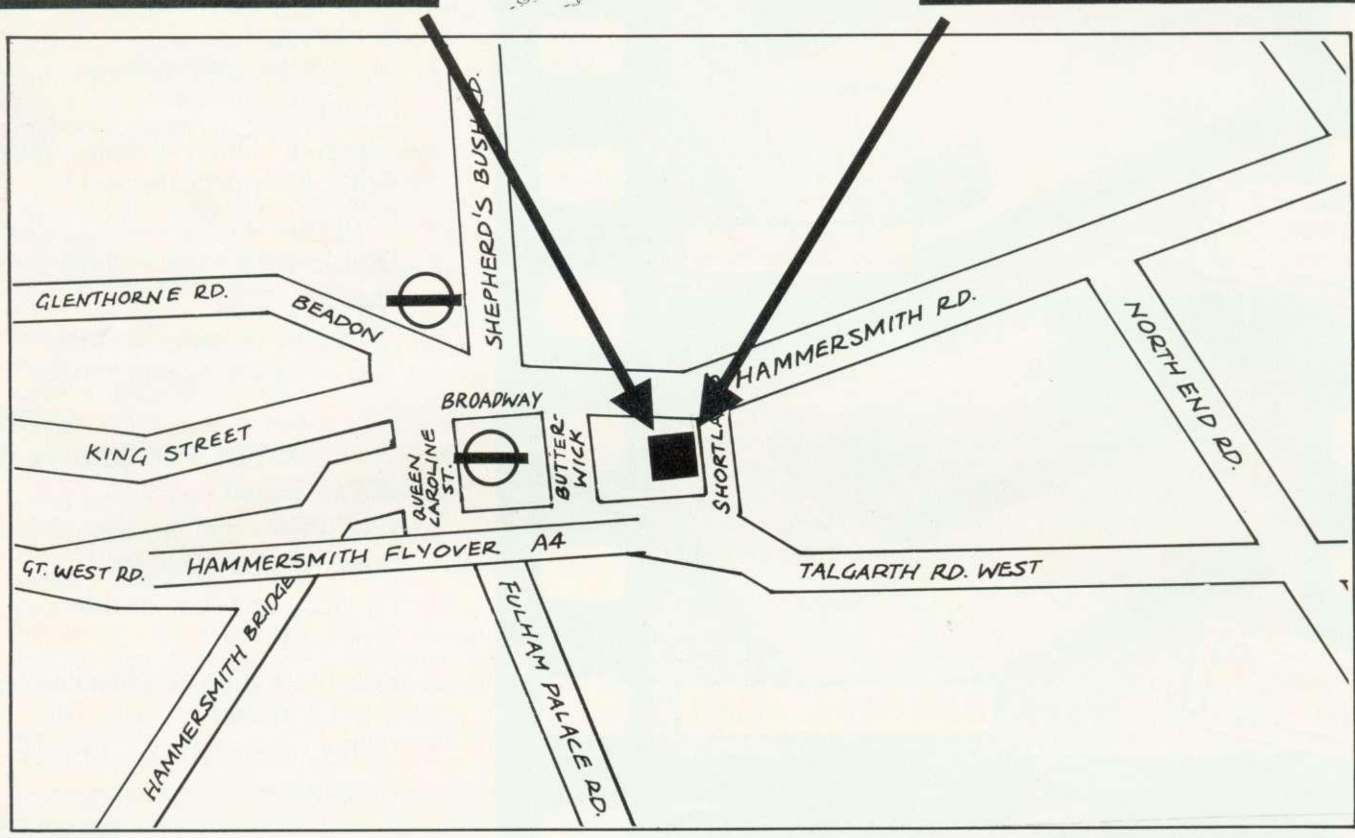


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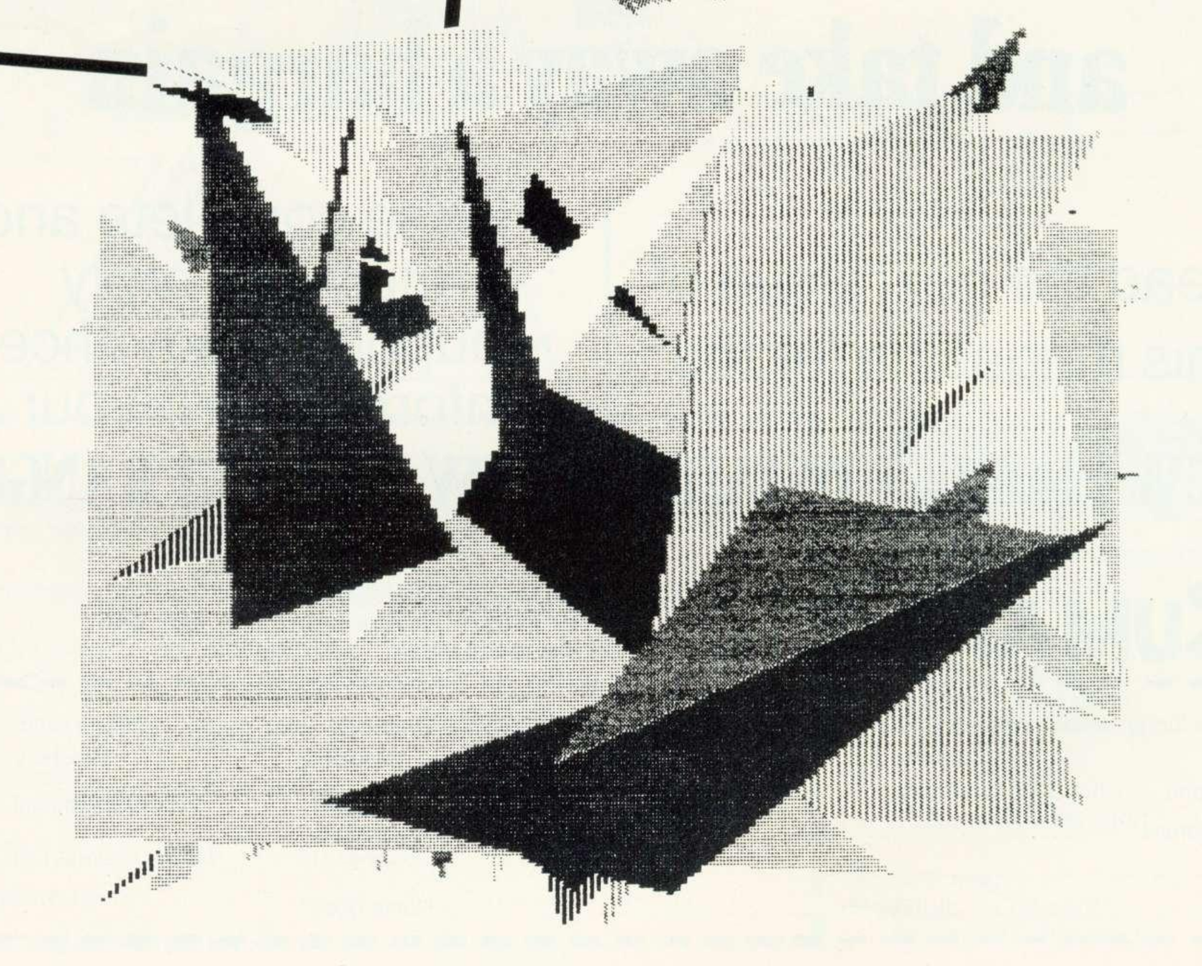




PRINTING SCREEN DUMPS

THESE two pictures show screen dumps printed on a Seikosha AP100 (roses, from April issue) and Olivetti (triangles below). To produce the trianges, type the listing in and run it. See George Hill's article for high resolution colour dump programs.

```
10REM RANDOM TRIANGLES
20MODE2
30REPEAT
40colour=RND(15)
50FOR I=1 TO 2
60X=RND(1279):Y=RND(1023)
70MOVEX,Y
80NEXT
90GCOL0,colour
100X=RND(1279):Y=RND(1023)
110PLOT85,X,Y
120Z=INKEY(0)
130UNTIL Z=32
```



CAGEY GRAPHICS

THIS program by Mike Milne draws a cylindrical cage in two colours by rotating a rectangle. Colour 1 controls the 'spokes' of the base and top circles which form the cage, and colour 2 decides on the colour of the 'bars'.

Just type the program in, run it, and follow the instructions. Limits are given for the size of the rectangle, and the number of steps in the rotation. These may be exceeded to produce some weird and wonderful effects!

The colour input can also be larger than the range given (1-7), and this will produce flashing colours.

If you don't wish to input any variables, just press return in each case and the computer chooses random sizes and colours.

```
 10 MODE 7
 20 PRINT:PRINT:PRINT
 30 PRINT"If you don't want to give the"
 40 PRINT"computer any instructions,"
 50 PRINT"simply press RETURN after"
 60 PRINT"each question."
 70 PRINT"The computer will decide for you."
 80 PRINT:PRINT:PRINT
 90
100 INPUT"WIDTH OF RECTANGLE (MAX 1300)" ,width
110 IF width=0 THEN a=200+RND(300) ELSE a=width/2
120 b=INT(a/3)
130 PRINT
140 INPUT"HEIGHT OF RECTANGLE (MAX 500)" ,height
150 IF height=0 THEN C1x=640:C1y=750:C2x=640:C2y=250:
    ELSE C1x=640:C1y=515+height/2:C2x=640:C2y=515-height/2
160 PRINT
170 INPUT"NUMBER OF STEPS (MAX 50)" ,step
180 IF step=0 THEN Q=15 ELSE Q=INT(step/2)
190
200 PRINT TAB(0,19)"1=red, 2=green, 3=yellow"
210 PRINT TAB(0,20)"4=blue, 5=magenta, 6=cyan, 7=white"
220 PRINT:INPUT"COLOUR 1" ,col1
230 PRINT:INPUT"COLOUR 2" ,col2
240 IF col1=0 THEN col1=RND(7)
250 IF col2=0 THEN col2=RND(7)
260
270 MODE 5
280 VDU 19,1,col1,0,0,0,19,3,col2,0,0,0
290 FOR N=Q TO 0 STEP-1:X=a*SIN(RAD
    (N*90/Q)):Y=SQR((1-(X^2/a^2))*b^2)
300   GCOL0,1:MOVE C1x+X,C1y-Y
310   DRAW C1x-X,C1y+Y
320   GCOL0,3:DRAW C2x-X,C2y-Y
330   GCOL0,1:DRAW C2x+X,C2y+Y
340   GCOL0,3:DRAW C1x+X,C1y-Y
350   NEXT N
360 FOR N=1 TO Q
370   X=a*SIN(RAD(N*90/Q)):
      Y=SQR((1-(X^2/a^2))*b^2)
380   MOVE C1x-X,C1y-Y
390   GCOL0,1:DRAW C1x+X,C1y+Y
400   GCOL0,3:DRAW C2x+X,C2y-Y
410   GCOL0,1:DRAW C2x-X,C2y+Y
420   GCOL0,3:DRAW C1x-X,C1y-Y
430   NEXT N
440 END
```

THE ROOT OF LINKED LISTS

Stan Froco analyses linked data structures, outlines trees, and produces a treesort

LINKED data structures are an important concept – especially for hash tables – and rely heavily on recursion (*Acorn User* May, July). The list: A B C D E is a sequence of items in order, A being the first and E the last. To emphasise the ordering we can use arrows:

A → B → C → D → E

For each item we need to know only two pieces of information: its name or value (A, B, C, D or E); the next item, if any is.

We can deduce further information from this about the list. For example, we may observe that the second item after A is C by observing the B follows A and then looking at B and observing C follows B. Item A need not actually hold the information that C is the item two further along.

You may now be able to see how this relates to hash tables (*Acorn User*, July). Items with the same hash value are put as a list, containing their values, instead of rehashing to find a space for the multiple items in the table.

This requires a suitable way of representing the information in a computer – a 'linked list'. The first piece of information, the name or value of the item, is held as a numeric value, character value or string. To represent where the next item is we can use the address of the next item in the computer's memory.

Basic provides some useful ways of doing this. We can set aside some memory by using the DIM statement: DIM fred%7.

Note that no brackets are used because this is not an array declaration. We are instead setting aside an area of memory of eight bytes, and fred% holds the address of this memory. We say that fred% 'points' to a 'vector' of eight bytes.

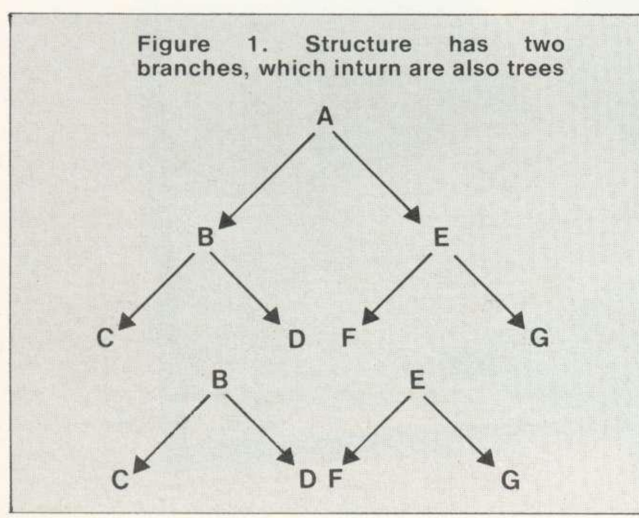
Two Basic operations are available to get at this vector. The ? operator can be used to look at and set up individual bytes, eg ?fred% = 37 and ?(fred% + 3) = 42. Note that this second example is identical to fred%?3 = 42.

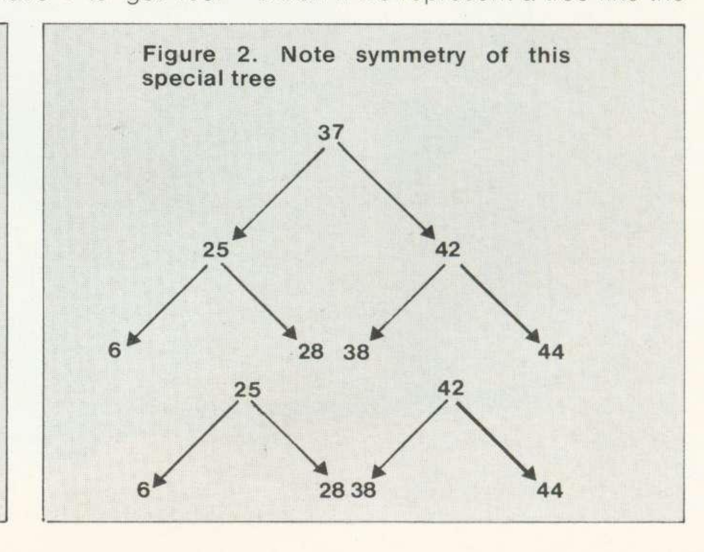
Similarly we have ! to get four bytes at a time eg, !fred% = 2000 * 2000 and fred%!3 = 42000000.

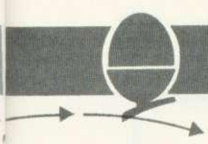
We now have everything needed to set up our list A B C D E, and program 1 provides the code. The first four bytes of each vector hold the name of the item, and the second eight point to the next item in the list. fred1% points to the whole of the list and is known as the 'head' of the list.

All this may seem trivial, so I shall describe a slightly more sophisticated data structure. Imagine an item with three pieces of information: The name or value of the item; an item following this item; a third item.

We could draw this as in figure 1, to represent a structure is called a 'tree', where A is its 'root' and there are two 'branches'. Notice the symmetry, and that each branch is itself a tree. Hence, C and D are the branches of B and F and G are branches of E. Items C, D, F and G have no branches and are called 'leaves' of the tree. Figure 2 shows a particularly useful tree which has the property that all the numbers on the left branch are less than the root, and all the numbers on the right branch are greater than the root. Furthermore, its two branches have exactly the same property. We can write a small procedure to print a tree like this with the numbers in order. If we represent a tree like the


Figure 1. Structure has two branches, which inturn are also trees


Figure 2. Note symmetry of this special tree



linked list earlier using three vectors:

- item!0 holds the value of the item
- item!4 points to the left branch
- item!8 points to the right branch

we can use PROCprintval (program 2) to print the tree out in order. Since the left and right branches are both trees, we use a recursive call to PROCprintval to print these out. We know when we have reached the bottom of a branch, because leaves have their pointers set to –1. If PROCprintval is called with –1 it knows it has no printing to do, and just returns.

All that is needed now is a way of setting up an ordered tree like this and we have another way of sorting numbers, treesort. For very large amounts of data it is even more efficient than Shell sort (*Acorn User*, June).

If we already have an ordered tree, FNaddelement from program 2 will add a new item to the correct place in the tree. If the new item is less than the root, we use a recursive call to add it to the left branch, otherwise we use a recursive call to add it to the right branch. When we get to the correct place at the bottom of the tree, FNaddelement is called with –1 (the pointer from a leaf). FNnewnode is then used to create a new leaf, with the value of the new item, and since it is a leaf, left and right branches are given the value –1.

The main program uses FNaddelement to generate a tree and then print it. First an array num% of random numbers is set up for sorting. Then the tree, tree% is initialised to –1. This is of course an ordered tree, but with no elements. FNaddelement is then used to add each item on to tree%. Finally PROCprintval is used to print the tree out in order.

Basic is not the best language for handling linked lists. The ? and ! operators provide greater flexibility than their cousins PEEK and POKE, but have been poached from another language, BCPL (*Acorn User*, April). Some languages have been designed solely on lists, the most famous being Lisp and its successors Logo and Prolog. For really serious handling of linked data structures (which underlie all large programs) one of these languages is needed.

Program 1. Setting up the list A B C D E

```
10 DIM fred1% 7
20 DIM fred2% 7
30 DIM fred3% 7
40 DIM fred4% 7
50 DIM fred5% 7
60
70 fred1%!0 = ASC("A")
80 fred1%!4 = fred2% :REM point to B
90 fred2%!0 = ASC("B")
100 fred2%!4 = fred3% :REM point to C
110 fred3%!0 = ASC("C")
120 fred3%!4 = fred4% :REM point to D
130 fred4%!0 = ASC("D")
140 fred4%!4 = fred5% :REM point to E
150 fred5%!0 = ASC("E")
160 fred5%!4 = -1 :REM point nowhere
```

Program 2. Complete treesort

```
10 ***********************************************************************
20 REM                    The main program                              *
30 ***********************************************************************
40
50 REM Sets up an ordered tree, and then prints it out in order
60
70 REM Set up numbers for sorting
80
90 DIM num%(99)
100 FOR i% = 0 TO 99
110    num%(i%) = RND(100) - 1
120 NEXT i%
130
140 tree% = -1 :REM An initially empty tree
150
160 REM Put the values on the tree
170
180 FOR i% = 0 TO 99
190    tree% = FNaddelement(num%(i%),tree%)
200 NEXT i%
210
220 REM Finally print out the ordered tree
230
240 @% = 4
250 PROCprintval(tree%)
260 END
270
280 ***********************************************************************
290 REM                    FNaddelement                                  *
300 ***********************************************************************
310
320 REM Adds val% to the tree pointed to by thistree%
330 REM If thistree% is -1 we have reached the bottom and can create
340 REM the new node in the right place.
350
360 DEF FNaddelement(val%,thistree%)
370
380 IF thistree% = -1 THEN =FNnewnode(val%)
390
400 REM Otherwise add to the left or right branch as appropriate.
410
420 IF val% < thistree%!0 THEN thistree%!4 = FNaddelement(val%,thistree%!4)
    ELSE thistree%!8 = FNaddelement(val%,thistree%!8)
430 =thistree%
440
450 ***********************************************************************
460 REM                    PROCprintval                                  *
470 ***********************************************************************
480
490 REM Prints out the tree pointed to by localtree%
500 REM print out the left branch, the root value, then the right branch
510 REM unless the tree is empty (-1).
520
530 DEF PROCprintval(localtree%)
540
550 IF localtree% = -1 THEN ENDPROC
560
570 PROCprintval(localtree%!4) :REM the left branch
580 PRINT localtree%!0 ; :REM the root value
590 PROCprintval(localtree%!8) :REM the right branch
600 ENDPROC
610
620 ***********************************************************************
630 REM                    FNnewnode                                     *
640 ***********************************************************************
650
660 REM Create a new leaf for num%
670
680 DEF FNnewnode(num%)
690 LOCAL temp%
700
710 DIM temp% 11
720 temp%!0 = num% :REM the value
730 temp%!4 = -1 :REM the left branch
740 temp%!8 = -1 :REM the right branch
750 = temp%
```

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ALL THE FUN OF THE FAIR

Joe Telford tests your strength, designs a passionometer, collects the cash and prints tickets for a summer shindig

SUMMER is the time for fetes and fairs and the BBC micro can mimic many of the novelty sideshows for just a few pounds worth of components. Let's start by counting the cash. On stalls dealing with money, there may be a need for the micro to keep track of cashflow, and we can exemplify this with a reference to an admissions stand.

Let's look at what might be required at the turnstiles. Normally there will be separate entry costs for adults, children and OAPs, added to which there may be a charge for a programme. The stall normally gives out a ticket in return. In addition, it would be helpful to automatically cost groups, sort out change, produce a balance for the end of day and give attendance statistics. The benefit of the computer here is that the stall can be run by one or two staff at most, and the statistics will prove useful for planning if the event is regular.

Program 1, can cope with admissions, and be adapted. Figure 1 is the insert for program 1. The only keys used by the operator will be these function keys plus the number keys. The program will actually issue tickets (figure 2), providing you have a 40 column printer (in this case a Tandy Graphics printer plotter, about £100 in the sales). If you don't wish to have a ticket, simply add a line: 1950 ENDPROC

The other facility is to produce a breakdown of admissions at the end of the day. This is normally produced on the printer so if you haven't one available, remove the VDU2 of line 1710. The escape key and autorepeat facility are turned off to help the operator.

Now let's see how to use program 1. When it is run, the screen will present the categories for admission. As people come to the stall each group can be entered by pressing the appropriate keys. For example, a group of three adults, two children and a senior citizen buying two programmes between them would be entered by

	Categories						Confirm		
f0 Statistics	f1 Adult	f2 Child	f3 OAP	f4 Progs	f5 Cancel	f6 Enter	f7 OK	f8 NO	f9 End day

Figure 1

St Michael's Church Fete
Admit 4 ADULT/S
80 p

St Michael's Church Fete
Admit 3 CHILD/REN
36 P

St Michael's Church Fete
Admit 1 SENIOR CITIZEN/S
10 p

Figure 2

******** Totals so far ********

Category	Number	Revenue
Adults	367	'73.4
Children	203	'24.36
OAP's	107	'10.7
Progrmmes	287	'14.35
TOTALS	677	'122.81

******** OK to continue! ********

Figure 3

Last number:- Grey Tickets 289

Last number:- Red Tickets 193

Last number:- PINK EDH203 506

Last number:- PINK XPY350 56

Last number:- Lucky Programme 633

Figure 4



pressing: Adult; Adult; Adult; Child; Child; OAP; Progs; Progs.

As the keys are pressed, the appropriate costs are shown and totalled. Mistakes can be rectified by pressing 'cancel' and starting again. If the group has been entered correctly the operator simply presses 'enter'. The computer then asks the operator to confirm the entry. All confirmations are answered with either OK or NO.

The computer then helps out with the adding up by inviting the operator to type the cash given. Once this is done and the 'enter' key pressed, the program calculates the change and asks for confirmation. NO results in this section restarting, while OK lets the printer produce tickets, and returns to the entry screen.

If at any time the current totals are required (except during a transaction) the operator simply presses 'statistics' and this presents the latest totals. The totals in the number column do not include the number of programmes sold, though the total income does include the income from programmes. Pressing OK moves back to the entry screen.

At the end of the day, 'end day' is pressed. This prints out a copy of the statistics page (figure 3) and asks for confirmation to end the program. Pressing NO returns the program to the entry screen, while OK ends the program.

Finally, it is worth explaining that costs can be altered simply by changing line 490. All costs are in pence except the stats screen, which is in pounds.

At many fetes, raffles take place for any number of things from food to computers. This often produces a multiplicity of effort, in tearing off stubbs and pulling numbers from hats (or other objects). If the ticket numbers or programmes are numerically sequenced, there is no reason why the Beeb shouldn't pick out the lucky number. Program 2 is a short example of this. It could even be used after program 1 providing the draws were made at the very end of the fete. Load and run the program. Answer the first question, by typing in the serial number of the tickets, and/or the colour. Remember that the program works with lucky programmes also, simply by typing a comment such

```
   10 REM*********************
   20 REM*                   *
   30 REM*  FETE ADMISSIONS  *
   40 REM*                   *
   50 REM*  Copyright  1983  *
   60 REM*                   *
   70 REM*    J. Telford.    *
   80 REM*                   *
   90 REM*********************
  100
  110 REM Lose escape key
  120 REM and Auto repeat
  130
  140 *FX220,0
  150 *FX11,0
  160 MODE7
  170 VDU23;8202;0;0;0;
  180
  190 REM find tnis proc to alter costs
  200
  210 PROC_setup
  220
  230 REM Main body of program
  240
  250 REPEAT
  260 CLS
  270 PROC_getpeople
  280 PROC_check
  290 PROC_change
  300 PROC_givetickets
  310 UNTIL FALSE
  320
  330 REM Procs start here::::::::::::
  340
  350 DEFPROC_setup
  360 *KEY0 T
  370 *KEY1 A
  380 *KEY2 C
  390 *KEY3 S
  400 *KEY4 P
  410 *KEY5 Q
  420 *KEY6 |M
  430 *KEY7 Y
  440 *KEY8 N
  450 *KEY9 E
  460
  470 REM alter this next line to suit.
  480
  490 Adult=20:Child=12:OAP=10:prog=5
  500 Nadults=0
  510 Nchildren=0
  520 Noaps=0
  530 Nprogs=0
  540 ENDPROC
  550 :::::::::::::::::::::::::::::
  560 DEFPROC_getpeople
  570
  580 REM temporary counters
  590
  600 TA=0:TC=0:TS=0:TP=0
  610 CLS
  620 REPEAT
  630 A$=INKEY$(0)
  640
  650 REM find out what has been presse
d
  660
  670 IF A$="E" PROC_endday
  680 IF A$="T" PROC_stats:UNTIL FALSE
  690 IF A$="A" TA=TA+1
  700 IF A$="C" TC=TC+1
  710 IF A$="S" TS=TS+1
  720 IF A$="P" TP=TP+1
  730 IF A$="Q" UNTIL TRUE:GOTO600
  740
  750 REM update screen
  760
  770 PRINTTAB(5,5);TA;" Adult/s.......
..."TA*Adult;" p"
  780 PRINTTAB(5,7);TC;" Child/ren.....
..."TC*Child;" p"
  790 PRINTTAB(5,9);TS;" Senior Citizen
/s."TS*OAP;" p"
  800 PRINTTAB(5,11);TP;" Programme/s..
...."TP*prog;" p"
  810 TT=TA*Adult+TC*Child+TS*OAP+TP*pr
og
  820 PRINTTAB(5,15);"Total...........
.."TT;" p"
  830
  840 REM until the ENTER key is presse
d
  850
  860 UNTIL A$=CHR$13
  870 ENDPROC
  880 ::::::::::::::::::::::::::::
  890 DEFPROC_check
  900
  910 REM this covers wrong keypresses
  920
  930 REPEAT
  940 REPEAT:PRINTTAB(5,2);"*****   CON
FIRM?  *****"
  950 A$=GET$:UNTIL A$="Y" OR A$="N" OR
 A$="Q"
  960 IF A$="Y" UNTIL TRUE:ENDPROC
  970 PROC_getpeople
  980 UNTIL FALSE
  990 :::::::::::::::::::::::::::::::
 1000 DEFPROC_change
 1010 REPEAT
 1020
 1030 REM this blanks confirm message.
 1040
 1050 PRINTTAB(5,2);"
 "
 1060 REPEAT
 1070
 1080 REM this covers change checking
 1090 PRINTTAB(5,17);"Cash given.......
 "
 1100 PRINTTAB(23,17);:INPUTC$
 1110 cash=VALC$
 1120 UNTIL cash >= TT
 1130 PRINTTAB(5,19);"Give change......
..";cash-TT;" p"
 1140
 1150 REM and again we confirm.
 1160
 1170 PRINTTAB(5,2);"*****   CONFIRM?
*****"
 1180 REPEAT:A$=GET$:UNTIL A$="Y" OR A$
="N" OR A$="Q"
 1190 IF A$="Y" PROC_addon:UNTIL TRUE:E
NDPROC
 1200 PROC_getpeople
 1210 PROC_check
 1220 UNTIL FALSE
 1230 ::::::::::::::::::::::::::::::::
 1240 ENDPROC
 1250 DEFPROC_stats
 1260
 1270 REM now give admissions to date
 1280
 1290 CLS
 1300 PRINT''TAB(3);"********   Totals
so far   ********"
 1310 PRINT''TAB(3);"Category      Numbe
r       Revenue"
 1320 PRINT'TAB(3);"Adults          ";Na
dults;
 1330 PRINTTAB(30);"`";Nadults*Adult/10
0
 1340 PRINT'TAB(3);"Children        ";Nc
hildren;
 1350 PRINTTAB(30);"`";Nchildren*Child/
100
 1360 PRINT'TAB(3);"OAP's           ";No
aps;
 1370 PRINTTAB(30);"`";Noaps*OAP/100
 1380 PRINT'TAB(3);"Progrmmes       ";Np
rogs;
 139. PRINTTAB(30);"`";Nprogs*prog/100
 1400
 1410 REM work out totals: BUT TN=
 1420 REM total number of people only.
 1430
 1440 TN=Nadults+Nchildren+Noaps
 1450 TM=(Nadults*Adult)+(Nchildren*Chi
ld)+(Noaps*OAP)+(Nprogs*prog)
 1460 PRINT'TAB(3);"TOTALS          ";TN
;
 1470 PRINTTAB(30);"`";TM/100
 1480 PRINT'TAB(3);"********  OK to con
tinue!  ********"
 1490
```

as 'White Programme'. Follow on by typing the number of the first programme or ticket sold, and the last one sold. Pressing the space bar now will start the random selection. After 10 seconds the program will select the winning number and the display will freeze until the space bar is pressed. After this, the program waits until you decide if another draw is required, then ends, or repeats accordingly. Users with printers available could record the winning numbers by adding lines:

```
235 VDU2
245 VDU3
```

which could lead to a printout as in figure 4.

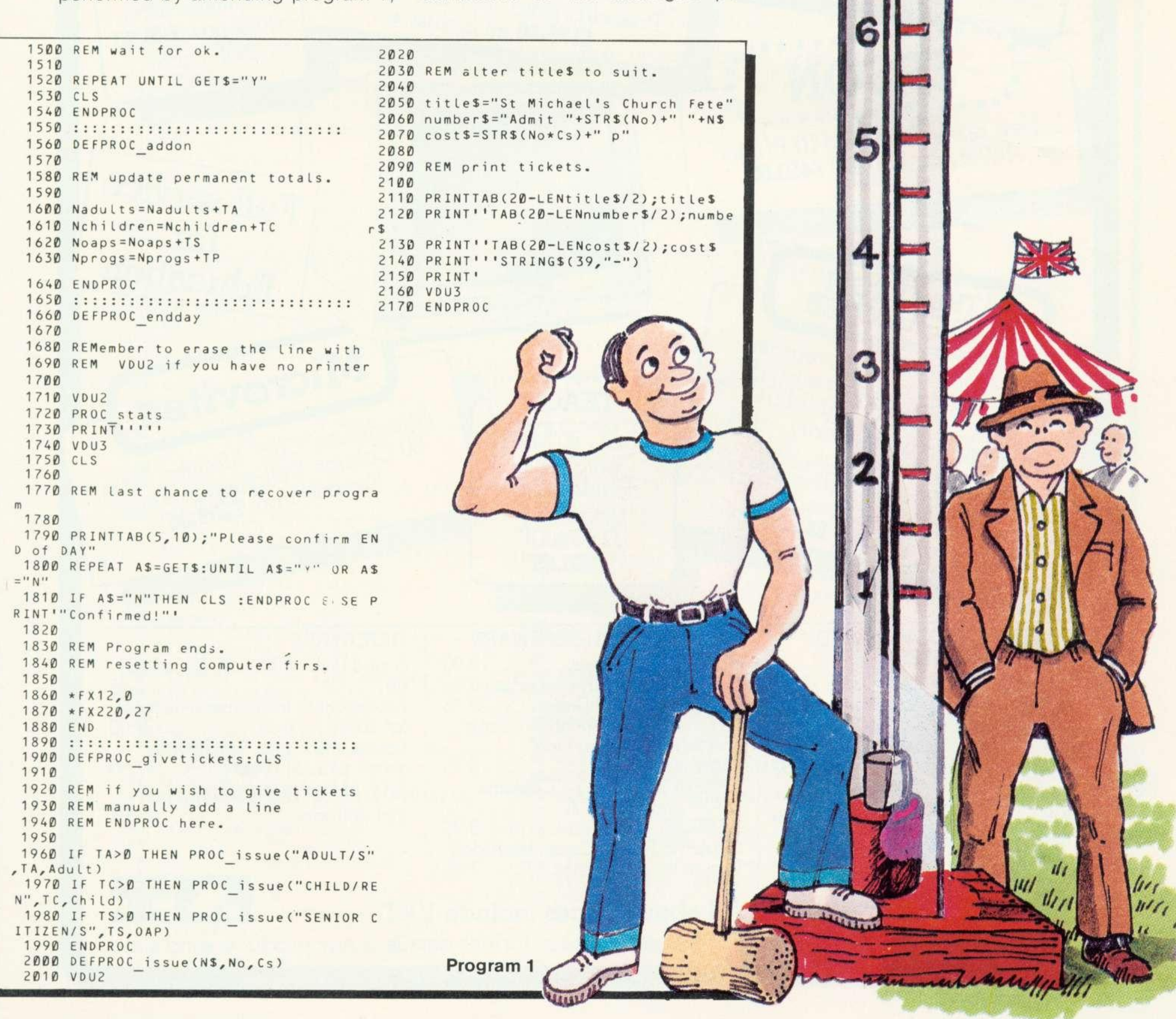
Application of the computer to jumble sales can be easily performed by amending program 1, in the case of stalls with few different items; or by more conventional methods for stalls with many products. I don't intend to go into program production for each stall, but I would suggest readers be very sure of what they require before coding a suitable program.

Some sideshows at fetes aim to entertain, and here the BBC micro can add to the enjoyment. We are going to concentrate on two aspects of physical activity, which can be produced with the help of the BBC micro and a shoestring budget.

These two activities require a small hardware add-on, which can be made for a few pounds. It is simply a pair of hand grips connected to the analogue port.

```
1500 REM wait for ok.
1510
1520 REPEAT UNTIL GET$="Y"
1530 CLS
1540 ENDPROC
1550 :::::::::::::::::::::::::::::::
1560 DEFPROC_addon
1570
1580 REM update permanent totals.
1590
1600 Nadults=Nadults+TA
1610 Nchildren=Nchildren+TC
1620 Noaps=Noaps+TS
1630 Nprogs=Nprogs+TP
1640 ENDPROC
1650 :::::::::::::::::::::::::::::::
1660 DEFPROC_endday
1670
1680 REMember to erase the line with
1690 REM  VDU2 if you have no printer
1700
1710 VDU2
1720 PROC_stats
1730 PRINT'''''
1740 VDU3
1750 CLS
1760
1770 REM last chance to recover progra
m
1780
1790 PRINTTAB(5,10);"Please confirm EN
D of DAY"
1800 REPEAT A$=GET$:UNTIL A$="Y" OR A$
="N"
1810 IF A$="N"THEN CLS :ENDPROC ELSE P
RINT'"Confirmed!"'
1820
1830 REM Program ends.
1840 REM resetting computer firs.
1850
1860 *FX12,0
1870 *FX220,27
1880 END
1890 :::::::::::::::::::::::::::::::
1900 DEFPROC_givetickets:CLS
1910
1920 REM if you wish to give tickets
1930 REM manually add a line
1940 REM ENDPROC here.
1950
1960 IF TA>0 THEN PROC_issue("ADULT/S"
,TA,Adult)
1970 IF TC>0 THEN PROC_issue("CHILD/RE
N",TC,Child)
1980 IF TS>0 THEN PROC_issue("SENIOR C
ITIZEN/S",TS,OAP)
1990 ENDPROC
2000 DEFPROC_issue(N$,No,Cs)
2010 VDU2
2020
2030 REM alter title$ to suit.
2040
2050 title$="St Michael's Church Fete"
2060 number$="Admit "+STR$(No)+" "+N$
2070 cost$=STR$(No*Cs)+" p"
2080
2090 REM print tickets.
2100
2110 PRINTTAB(20-LENtitle$/2);title$
2120 PRINT''TAB(20-LENnumber$/2);numbe
r$
2130 PRINT''TAB(20-LENcost$/2);cost$
2140 PRINT'''STRING$(39,"-")
2150 PRINT'
2160 VDU3
2170 ENDPROC
```

Program 1



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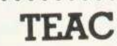
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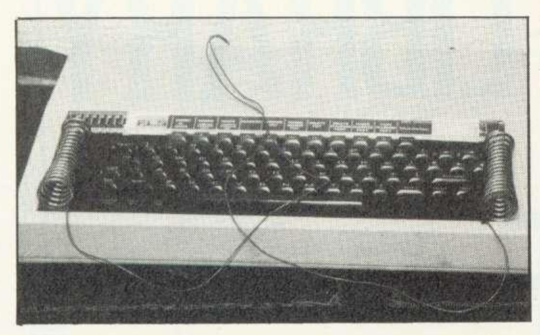
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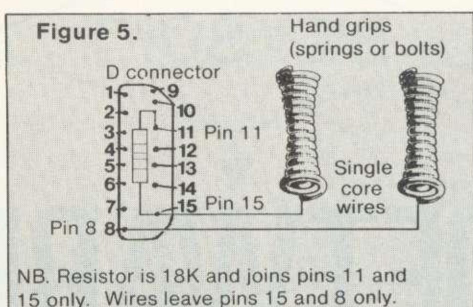


Table 1. Hardware list

Item	Cost
18K resistor	3p
2 pieces wire	0p
15-pin D connector	250p
Cover for connector	300p
2 grips	0p
Total	approx 553p

page 31 ▶

Program 2.

```
   10 REM LUCKY NUMBER
   20 REM RAFFLES PROG
   30 REM (C) JOE TELFORD 1983
   40
   50 *FX11,0
   60 REPEAT
   70
   80 REM get the base number/colour.
   90
  100 PROC_colour
  110
  120 REM find range of sold tickets
  130
  140 PROC_range
  150 MODE5
  160
  170 REM do the draw
  180
  190 PROC_draw
  200 MODE7
  210
  220 REM retain last number 'in case'
  230
  240 PRINT'''Last number:-  ";Colour$;
 " ";N$
  250 PRINT'''TAB key ends program"
  260 PRINT'"RETURN continues"
  270 *FX21,1
  280
  290 REM check for END
  300
  310 UNTIL GET=9
  320 *FX12,0
  330 PRINT''"Bye":END
  340
  350 REM Procs start here::::::::::::
  360
  370 DEFPROC_colour
  380
  390 REM a colour or a code number
  400 REM can be entered here.
  410
  420 CLS
  430 PRINTTAB(3,5);"Please type the co
 lour AND/OR the"
  440 PRINTTAB(3,7);"serial number of t
 he set of tickets."
  450 REPEAT:PRINTTAB(3,10);STRING$(30,
 " ")
  460 INPUT TAB(3,10) Colour$
  470 UNTIL Colour$>" "
  480 ENDPROC
  490 :::::::::::::::::::::::::::::::::
  500 DEFPROC_range
  510
  520 REMember tickes must be sold
  530 REM sequentially
  540
  550 CLS
  560 PRINTTAB(3,5);"Please type the nu
 mber of the first"
  570 PRINTTAB(3,7);"ticket sold:-"
  580 REPEAT:PRINTTAB(3,10);STRING$(30,
 " ")
  590 INPUT TAB(3,10) lowno
  600
  610 REM check for silly input
  620
  630 UNTIL lowno>0
  640 PRINTTAB(3,15);"Please type the n
 umber of the last"
  650 PRINTTAB(3,17);"ticket sold:-"
  660 REPEAT:PRINTTAB(3,20);STRING$(30,
 " ")
  670 INPUT TAB(3,20) highno
  680
  690 REM check for silly input
  700
  710 UNTIL highno>lowno
  720
  730 REM This is equivalent to putting
  740 REM ones hand in the hat!
  750
  760 PRINTTAB(3,23);"Press SPACE bar t
 o continue";
  770 *FX15,0
  780 REPEAT UNTIL GET=32
  790 ENDPROC
  800 :::::::::::::::::::::::::::::::::
  810 DEFPROC_draw
  820
  830 REM turn off crsr
  840
  850 VDU23;8202;0;0;0;
  860
  870 REM backn col is red, foregrnd
  880 REM is yellow, white &black
  890
  900 COLOUR129:CLS
  910 COLOUR3
  920
  930 REM print code centrally.
  940
  950 PRINTTAB(10-LENColour$/2,5);Colou
 r$
  960 t=TIME+1000
  970 REPEAT
  980
  990 REM print random ticket numbers
 1000 REM until one is finally chosen
 1010
 1020 PRINTTAB(0,15);STRING$(19," ")
 1030 N$=STR$(RND(highno-lowno+1)+(lown
 o-1))
 1040 PRINTTAB(10-LENN$/2,15);N$
 1050 SOUND1,-15,RND(255),4
 1060 T1=TIME+20:REPEAT UNTIL TIME>T1
 1070 UNTIL TIME>t
 1080
 1090 REM Whoopee
 1100
 1110 ENVELOPE1,0,1,2,4,48,48,24,126,0,
 0,-127,126,0
 1120 SOUND1,1,100,20
 1130 COLOUR0
 1140
 1150 REM COPY THIS NUMBER DOWN FOR
 1160 REM FUTURE REFERENCE
 1170 REM OR ADD PRINTER OUTPUT
 1180
 1190 PRINTTAB(0,25);"SPACE bar when re
 ady";
 1200 *FX21,1
 1210 REPEAT UNTIL GET =32
 1220 ENDPROC
>
```

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- Full use of sound reactions, but only with correct answers!
- Incorrect entries show equivalent number, then original entry counts to correct number. Records every entry to identify problem figures.

Suitable for 4-6 year olds and BBC Model B.

```
Telling the time - hours & minutes
What time is it ?
20 minutes past
2 O'clock
WELL
DONE!
```

TIMEMAN ONE

WORLD-WISE

Two programs enabling children to build up fascinating information banks on their favourite geography subjects. Covers both UK and World in a series of 10 categories including, e.g. canals, towns, antiquities, etc. Your atlases and reference books well used as they try to find a river that passes through the Equator, or who built the Parthenon! Features:
- Powerful review/edit facilities to correct entries if required.
- Save and load the data at any time.
- Personalised responses with attractive sound.
- Maintains extensive information on individual childrens' entries.

Suitable for ages 7-15 and BBC Model B.

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- Telling hours • Telling minutes • Telling hours and minutes
- Setting hours • Setting minutes • Setting hours and minutes
- Attractive use of sound, but level adjustable. • Children shown the correct answer after each wrong entry, and the chance to try again. • Features full BES MONITOR – records individual childrens' separate entries. • Ability and needs easily identified, practice at specific stages can then be chosen.

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- Stimulates fascinating (and educational!) discussions as to the difference between alligators and crocodiles, and whether oil is vegetable or mineral.
- Encourages use of reference books as children try to find the answers to their own questions.
- Maintains full information on individual childrens' entries.

Suitable for ages 7-13 years and BBC Model A and B.

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20	Wordhang	____	£8.97	____	£10.99	£
21	Animal/Vegetable/Mineral	____	£5.69	____	£10.99	£
22	Happy Numbers	____	£8.97	____	£10.99	£
23	Timeman One	____	£8.97	____	£10.99	£

I enclose cheque payable to BES   Total: £

Name ....

Address ....



Program 3

```
   10 REM*********************
   20 REM*                   *
   30 REM*   STRENGTH METER  *
   40 REM*                   *
   50 REM*  Copyright  1983  *
   60 REM*                   *
   70 REM*    J. Telford.    *
   80 REM*                   *
   90 REM*********************
  100 ON ERROR GOTO 290
  110 MODE1
  120
  130 REM Main program follows
  140
  150 PROC_array
  160 REPEAT
  170 PROC_calibrate
  180 PROC_teststrength
  190 PROC_details
  200
  210 REM check for normal exit
  220
  230 UNTIL FN_yesno="N"
  240 MODE7
  250 PRINT''"Bye.":END
  260
  270 REM error trapped exit
  280
  290 MODE7
  300 PRINT':REPORT:PRINT" at ";ERL
  310 PRINT'"Bye.":END
  320
  330 REM PROCS start here::::::::::
  340
  350 DEFPROC_calibrate
  354
  355 REM setup screen windows
  356
  360 PROC_setupscreen
  370 PROC_printmessage("Place handgrips across open palms",1,1)
  380 PROC_printmessage("of the competitor.",3,1)
  390 PROC_printmessage("Then press SPACE bar",5,1)
  394
  395 REM wait for space bar
  396
  400 *FX15,0
  410 REPEAT UNTIL GET=32
  420 CLS
  424
  425 REM get calibration input
  426 REM and settle the pointer
  427
  430 PROC_printmessage("Please Wait till the pointer settles",3,1)
  440 offset=FN_ADC(1)*100 DIV 512
  450 PROC_meter(offset,470)
  460 FOR O%=offset TO 0 STEP-1
  470 PROC_meter(O%,470)
  480 NEXT
  490 ENDPROC
  495 :::::::::::::::::::::::::::::::
  500 DEFPROC_teststrength
  504
  505 REM now test strength.
  506
  510 CLS
  520 PROC_printmessage("GRIP HARD!",3,1)
  530 REPEAT
  534
  535 REM if competitor leaves hold of
  536 REM of the grips then this ends
  537 REM his go.
  538
  540 value=FN_ADC(1):IFvalue<2 THEN UNTIL TRUE:ENDPROC
  544
  545 REM Scale ADC input to pointer
  546
  550 value=(value*100 DIV 512)-offset
  560 IFvalue>lastpos THEN PROC_meter(value,470):CLS:PROC_printmessage(A$(INT((value)/10)),3,1)
  570 UNTIL FALSE
  575 :::::::::::::::::::::::::::::::::
  580 DEFPROC_details
  584
  585 REM digital readout for 2 secs
  586
  590 CLS:PROC_printmessage("you gripped at "+STR$(lastpos)+" on the scale",1,1)
  600 t=TIME+200:REPEAT UNTIL TIME>t
  604
  605 REM check for cheat!
  606
  610 IF lastpos+offset>98 THEN630
  614
  615 REM check for strength
  616
  620 IF lastpos>tab(10) THEN PROC_addon
  624
  625 REM show best ten.
  626
  630 PROC_show
  640 CLS:ENDPROC
  645 :::::::::::::::::::::::::::::::::
  650 DEFPROC_addon
  654
  655 REM find place to put new name
  656
  660 flag=11
  670 FOR I%=10 TO 0 STEP-1
  680 IF lastpos<tab(I%) THEN flag=I%:I%=0
  690 NEXT
  700 flag=flag+1
  710 FOR I%=9 TO flag STEP-1
  720 tab(I%+1)=tab(I%):N$(I%+1)=N$(I%)
  730 NEXT
  740 tab(flag)=lastpos
  744
  745 REM enter name for list.
  746
  750 PROC_printmessage("You are in the top ten grippers!",1,1)
  760 REPEAT:VDU4
  770 PRINT'"Please enter NAME >> ";:INPUTN$(flag)
  780 UNTIL N$(flag)>CHR$(32)
  790 ENDPROC
  795 :::::::::::::::::::::::::::::::::
  800 DEFPROC_show
  804
  805 REM clear gr. screen to show list
  806
  810 GCOL0,130:CLG:CLS
  820 GCOL0,0
  830 VDU5:MOVE-192,550:PRINT"BIG GRIPPERS"
  840 FOR Y=400 TO -50 STEP-50
  850 MOVE-192,Y:PRINT;tab((400-Y)/50+1);" ";N$((400-Y)/50+1)
  860 NEXT:VDU4
  870 ENDPROC
  875 ::::::::::::::::::::::::::::::::
  880 DEF FN_yesno
  890 CLS
  900 PROC_printmessage("Y to continue N to end",3,1)
  910 REPEAT I$=GET$:UNTIL INSTR("YyNn",I$)
  914
  915 REM convert to uppercase.
  916
  920 I$=CHR$(ASC(I$) AND 223)
  930 =I$
  935 ::::::::::::::::::::::::::::::
  940 DEFPROC_setupscreen
  950
  960 REM setup a purple background
  970
  980 VDU19,0,5,0;0;
  990 GCOL0,128:CLG
 1000
 1010 REM setup a yellow gr. window
```

Program 3 cont ▶



Program 3, page 34, cont

```
1020
1030 VDU24,32;290;1248;974;
1040 GCOL0,130:CLG
1050
1060 REM setup a white text window
1070
1080 VDU28,1,30,38,24
1090 COLOUR131:COLOUR1:CLS
1100
1110 REM centre of gr area
1120
1130 VDU29,640;400;
1140 PROC_drawmeter(500,10,10)
1150 ENDPROC
1155 :::::::::::::::::::::::::::::::::
1160 DEFPROC_drawmeter(r,M,S)
1164
1165 REM draw meter based on \circle
1166 REM outer arc
1167
1170 MOVE -r,0
1180 GCOL0.0
1190 FOR angle = PI TO 0 STEP-.1
1200 DRAWr*COSangle,r*SINangle
1210 NEXT
1214
1215 REM inner arc
1216
1220 MOVE -r+20,0
1230 FOR angle = PI TO 0 STEP-.1
1240 DRAW(r-20)*COSangle,(r-20)*SINang
le
1250 NEXT
1254
1255 REM do graduations.
1256
1260 MOVE -r+20,0:DRAW -r-20,0
1270 c=-1
1280 FOR angle = PI TO 0 STEP-(PI/(M*S
))
1290 c=c+1
1300 MOVE(r-20)*COSangle,(r-20)*SINang
le
1310 a=r*COSangle:b=r*SINangle
1320 a1=(r+20)*COSangle:b1=(r+20)*SINa
ngle
1330 IF (c MOD S)=0 THEN DRAWa1,b1 ELS
E DRAWa,b
1340 NEXT
1344
1345 REM add numbers
1346
1350 c=0:VDU5
1360 MOVE-r-36,0
1370 FOR angle = PI TO -0.1 STEP-(PI/(
M))
1380 MOVE(r+52)*COSangle-16,(r+52)*SIN
angle
1390 PRINT;c
1400 c=c+1
1410 NEXT
1414
1415 REM pointer centre
1416
1420 MOVE-16,16:PRINT"O"
1430 VDU4
1440 lastpos=0
1450 ENDPROC
1455 :::::::::::::::::::::::::::::::::
1460 DEFPROC_printmessage(M$,l,c)
1470 COLOURc:PRINTTAB(19-LENM$/2,l);M$
1480 ENDPROC
1485 :::::::::::::::::::::::::::::::::
1490 DEFFN_ADC(chnl)
1500 =512-ADVAL(chnl)DIV128
1505 :::::::::::::::::::::::::::::::::
1510 DEFPROC_meter(value,rad)
1514
1515 REM rubout pointer
1516
1520 GCOL0,2
1530 val=PI-(PI/100)*lastpos
1540 PROC_drawneedle(val,rad)
1544
1545 REM and redraw it.
1546
1550 GCOL0,1
1560 val=PI-(PI/100)*value
1570 PROC_drawneedle(val,rad)
1580 lastpos=value
1590 ENDPROC
1595 :::::::::::::::::::::::::::::::::
1600 DEFPROC_drawneedle(angle,r)
1604
1605 REM needle from 2 triangles
1606
1610 p1=(r/2)*COS(angle-.04):q1=(r/2)*
SIN(angle-.04)
1620 p2=(r/2)*COS(angle+.04):q2=(r/2)*
SIN(angle+.04)
1630 p3=r*COS(angle):q3=r*SIN(angle)
1640 MOVE0,0:MOVEp1,q1:PLOT85,p2,q2
1650 PLOT85,p3,q3
1660 VDU5:MOVE-16,16:PRINT"O":VDU4
1670 ENDPROC
1675 :::::::::::::::::::::::::::::
1680 DEFPROC_array
1684
1685 REM A$()=comments:N$()=names
1686 REM tab()=table of values
1687
1690 DIMA$(10),N$(10),tab(10)
1700 FOR I%=0 TO 10:READ A$(I%)
1710 N$(I%)="Kitty "+STR$(I%):tab(I%)=
10-I%
1720 NEXT:tab(0)=100:ENDPROC
1730 DATA strong as a fly
1740 DATA Just a baby.
1750 DATA This would be ok for a girl!
1760 DATA You are strong enough to pus
h toy cars
1770 DATA AVERAGE
1780 DATA GOOD!
1790 DATA HE-PERSON
1800 DATA SUPER STRONG
1810 DATA ***** CHAMPION *****
1820 DATA Cheat!
1830 DATA This shouldnt occur normally
>
```



Figure 5 shows the finished product. Construction is left up to the individual user, but the main components are shown in table 1. The handgrips shown are from two old soldering iron stands, but large metal bolts would do just as well. The diagram is shown in figure 6 and it is possible for the resistor to be located inside the ADC connector.

WARNING! As usual, neither the author nor *Acorn User* can accept liability for harm caused to users who connect this apparatus to a dangerous voltage supply. The ADC connector in this application will apply a potential of approx 1.8 volts. This is normally safe, and the unit has been used frequently by the author and other people. However, larger voltages could prove dangerous, and mains voltages are inevitably lethal. Please ensure your ADC reference voltage is about 1.8V before connecting this appliance.

Soldering at the connector is usually done quickly, while a good deal of heat may be required at the gripping end. With bolts, two nuts may be used to sandwich the wire.

Now let's use this apparatus for a test of strength. Well, actually, the progam measures body resistance. To cut down the effects of moist palms, the program is automatically calibrated for each person. There is enough of a relationship between strength and hand resistance for the results to produce heated discussion by competitors.

When you load and run the program, the screen displays a meter marked from 0 to 10, and gives instructions for calibration. Once the grips are placed on the open palms the space bar is pressed and the program calculates a handicap for the present gripper. It measures and displays the strongest grip, until the grips are released. The program also comments, occasionally none too pleasantly, about the user's strength.

If the maximum strength exhibited is in the 'big grippers' table, he/she can record his or her name for others to wonder at. The program then cycles back to the start for the next candidate. (At a recent fete, this program drew many entries at 5p a go from a large group of teenagers keen to outdo each other.)

It is possible to turn the strength test program into a 'passionometer', a particularly useful exercise at parties. The main program is identical, but a few lines are altered. Once users are au-fait with the strength program, using the passionometer becomes easy. The basic difference is that each person in the couple holds one hand grip, and in addition the couple hold hands. Leaving loose of a partner's hand indicates that the 'kissing' has stopped.

Again suitable comments are made by the micro, and the 'intensity of kiss' is displayed for all to see. Program 4 contains only the changes to program 3. No lines need removing, though two need adding. Line 555 is particularly important as it scales the 'strength reading' into a 'kiss factor'. It may need adjusting for the average passion level of your local couples, but whatever happens, it will be amusing.

Program 4. Kissometer additions

```
  370PROC_printmessage("Couple should
loosely hold hands",1,1)
  380PROC_printmessage("then each hold
1 terminal loosely",3,1)
  520PROC_printmessage("KISS
HARD!",3,1)
  555value=value*2
  556 IF value)99 THEN value=99
  590CLS:PROC_printmessage("You kissed
at "+STR$(lastpos)+" on the scale",1,1)
  830VDU5:MOVE-192,550:PRINT"GREAT
LOVERS"

850MOVE-384,Y:PRINT;tab((400-Y)/50+1);"
";N$((400-Y)/50+1)
 1710N$(I%)="Antony & Cleopatra
"+STR$(I%):tab(I%)=10-I%
 1730DATA A couple of Waxworks
 1740DATA Is this your first meeting?
 1750DATA Just a couple of peckers
 1760DATA Only average!!
 1770DATA Thats a smacker
 1780DATA Do your parents know about
this?
 1790DATA Wow Wow Wow!
 1800 DATA A really smouldering
romance.
 1810 DATA ********ON FIRE*********
 1820DATA CHEAT!
```

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NEW..................£59.95



J. B. SNOOKER T/A POT BLACK

* TRIAL BALANCE AT 31/12/82 *

	ACCOUNT	DEBIT £		CREDIT £
1	Sales (1)			40000
2	Sales (2)			45001
7	Opening Stock & WIP	3000		
8	Purchases (1)	31600		
9	Purchases (2)	17150		
12	Closing Stock & WIP			5000
13	Sundry Income			700
14	Wages	8430		
15	Wife's Wages	1200		
16	Rent & Rates	1925		
17	Heat Light & Power	625		
18	Telephone	1620		
20	Insurance	211		
21	Motor Expenses	2580		
24	Repairs & Renewals	740		
27	Sundry Expenses	911		
28	Accountancy	600		
29	Legal & Professional	150		
31	Finance Charges	5510		
32	Bad Debts Written Off	1269		
33	Motor Vehicles - Dep'n	200		
35	Plant/Equipment - Dep'n	150		
36	Leasehold Property - Dep'n	100		
37	Loss/(Profit) on Sale of Assets	150		
47	Cash in Hand	500		
48	Bank (1)			34400
49	Bank (2)	500		
50	Freehold Property	20000		
52	Leasehold Property	30000		
53	Leasehold Property - Acc Dep'n			5000
56	Motor Vehicles	4000		
57	Motor Vehicles - Acc Dep'n			500
58	Plant & Equipment	2500		
59	Plant & Equipment - Acc Dep'n			500
60	Goodwill		2000	
61	Debtors & Prepayments	2000		
63	Trade Creditors & Accruals			9300
65	H.P. (1)			900
69	H.P. Interest Res (1)	100		
74	VAT Input Tax	5163		
75	VAT Output Tax			9063
76	VAT Refunds/Payments	4400		
77	Capital A/c (1)			15000
78	Capital A/c (2)			5000
81	Capital Introduced (1)			500
85	Drawings (1)	8800		
86	Drawings (2)	12000		
89	Long Term Loans			4000
90	Stock & WIP	5000		
	TOTALS	174864		174864

N. B. Sundry Expenses debited by £1, due to rounding errors.

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J. B. SNOOKER T/A POT BLACK

* BALANCE SHEET AT 31/12/82 *

	1982 £	1981 £
Fixed Assets	50500	30950
Goodwill	2000	2000
	52500	32950
CURRENT ASSETS:		
Stock & WIP	5000	3000
Debtors & Prepayments	2000	4000
Cash in Hand	500	200
VAT recoverable	500	
	8000	7200
LESS CURRENT LIABILITIES:		
Trade Creditors & Accruals	9300	3300
H.P.	800	1000
Bank Overdraft	33900	8250
VAT payable		600
	44000	13150
NET CURRENT ASSETS/(LIABILITIES)	(36000)	(5950)
NET ASSETS/(LIABILITIES)	£ 16500	£ 27000
REPRESENTED BY:		
Capital A/c (1)	13200	16000
Capital A/c (2)	(700)	6000
Long Term Loans	4000	5000
	£ 16500	£ 27000

J. B. SNOOKER T/A POT BLACK

* TRADING AND PROFIT/LOSS ACCOUNT *

PERIOD: 1 YEAR ENDED 31/12/82

[illegible]

NOTES TO THE ACCOUNTS - 31/12/82

1. FIXED ASSETS

	Land & Buildings £	Motor Vehicles £	Plant & Equipment £	TOTAL £
Cost or Valuation	50000	4000	2500	56500
Acc. Depreciation	5000	500	500	6000
NBV - 1982	£45000	£3500	£2000	£50500
NBV - 1981	£25100	£3700	£2150	£30950

2. LAND AND BUILDINGS

	1982 £	1981 £
Land and buildings comprise:		
Freehold Property	20000	
Leasehold Property	25000	25100
	£45000	£25100

3. CAPITAL ACCOUNTS

		(1) £	(2) £
	Opening Capital	15000	5000
Add	Capital Introduced	500	0
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		21800	11300
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NEW

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```
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              II              A            II    B    II    C     II
 1            -J.B. SNOOKER T/A POT-BLACK
 2            PROJECTED CASH FLOW               YEAR        ENDED
 3
 4                                               Oct.        Nov.
 5                                                £           £
 6            INCOME
 7            Sales                             11786       10944
 8                                              -----       -----
 9
10            REVENUE EXPENDITURE
11            Purchases                           500         500
12            Advertising                         500        1000
13            Director's salary                  1596        1596
14            Salaries                           2216        2216
15            Rent
16            Telephone                                       300
17            Insurance                                       200
18            Printing, stationary                            400
19            Repairs & renewals
20            Hire of equipment                    60          60
      COMMAND BCDEFGPRSTW*?
```

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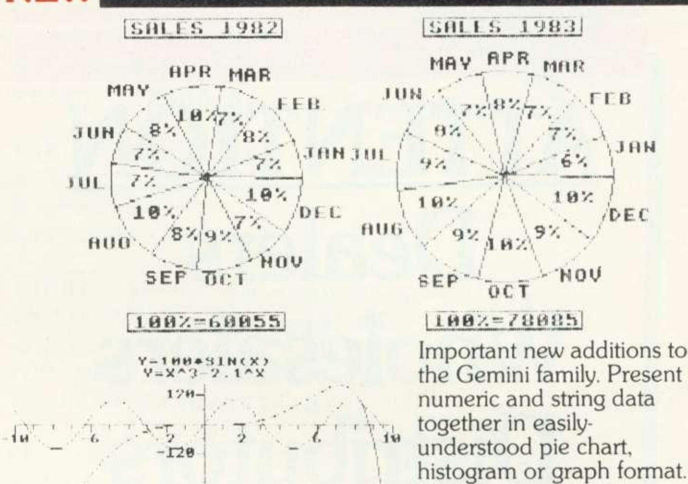
* Small business accounting applications, e.g. profit and loss statements and cashflow projections, break-even analyses etc.
* Investment project appraisal—anything from double glazing to oil rigs!
* Comparing rent/lease/buy options.
* Processing the results of scientific experiments or field studies.
* Engineering calculation models.
* In fact, anything that involves repeated re-calculation of results presented in tabular or spreadsheet format.

Program Availability Chart:-

	Database	Stock Control	Mailist	Invoices & Statements	Spread sheet Analysis	Cashbook Accounting	Word processor	Home Accounts	Commercial Accounts	Plot	Final Accounts
Sinclair Spectrum 16k or 48k	●	●	●			●		●	●	●	●
Dragon 32k or 64k	●	●	●	●	●			●	●	●	
VIC 20 (16k +)	●	●	●	●				●	●		
Sinclair ZX81 (16k +)	●										
Grundy Newbrain	●		●								
Sharp MZ80A	●	●	●	●				●	●		
Sharp MZ80K	●	●	●	●				●	●		
Sharp MZ80B	●	●	●	●				●	●		
BBC Micro model A or B 32k	●	●	●	●	●	●	●	●	●	●	●
Atari 400/800	●										
Torch	●	●	●	●	●	●	●	●	●	●	●
Epson HX-20	●	●	●								
Commodore 64	●		●					●			

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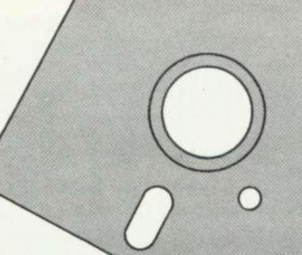
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THE 40/80 DISC SOLUTION

Rupert Howell gets around the problem of copying 40 track software onto 80 track discs with two 80 track drives

OWNERS of 80 track drives will almost certainly have discovered how difficult it is to copy 40 track software onto 80 track discs particularly when no 40 track drive is to hand. Program 1 overcomes this problem by reading alternate tracks of an 80 track drive to enable it to copy 40 track discs. The program requires a dual 80 track disc system and creates an 80 track disc from a 40 track source disc, altering the catalogue as appropriate so space is not wasted.

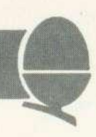
Once you have loaded the program insert the 40 track source disc in one of the 80 track drives and an 80 track disc in the other. The program requests the drive number to copy from (0 to 3) and a drive number to copy to (0 to 3); it then automatically copies the conents of the 40 track disc onto the 80 track, and changes the catalogue to specify that the remaining half of the disc is free. Make sure you put the correct disc in the correct drive – and that the 40 track disc is write-protected to avoid disasters.

Screen mode 7 is automatically set so the program can dimension a large array (W%) which it uses to buffer the data read from the disc. After being given the two drive numbers, it copies the 40 tracks of information to the destination disc in blocks, using procedures SETLEN , READ40 and WRITE80.

First, SETLEN selects the

```
  10 IF HIMEM<&7C00 THEN MODE 7
  20 PRINT'"40-80 Disk Copier V0.10"'
  30
  40 DIM X%30,W%20480
  50 NT%=8
  60 osword=&FFF1
  70 oscli=&FFF7
  80
  90 INPUT "Drive to copy from ? "D1%
 100 INPUT "Drive to copy to   ? "D2%
 110
 120 FOR I%=0 TO 39 STEP NT%
 130 IF I%+NT%>40 NT%=40-I%
 140 FOR J%=0 TO NT%-1
 150 PROCread40(D1%,I%+J%,0,10,W%+2560
     *J%)
 160 NEXT J%
 170 IF I%=0 PROCsetlen
 180 FOR J%=0 TO NT%-1
 190 PROCwrite80(D2%,I%+J%,0,10,W%+256
     0*J%)
 200 NEXT
 210 NEXT
 220 END
 230
 240 DEF PROCsetlen
 245 Y%=X% DIV 256
 250 $X%="DR."+STR$(D2%):CALL oscli
 260 A%=&7E:CALL osword
 270 W%?&107=X%?1:W%?&106=X%?2
 280 ENDPROC
 290
 300 DEF PROCwrite80(DR%,TR%,SC%,NR%,W
     %)
 310 LOCAL I%
 320 ?X%=DR%:X%?5=3:X%?6=&4B:X%?7=TR%:
     X%?8=SC%:X%?9=NR% OR &20
 330 I%=0
 340 REPEAT
 350 E%=FND(10,W%)
 360 I%=I%+1
 370 UNTIL E%=0 OR I%>5
 380 IF E%<>0 PRINT"Error ";E%;" at ";
     DR%;"/";TR%;"/";SC%:END
 390 ENDPROC
 400
 410 DEF PROCread40(DR%,TR%,SC%,NR%,W%
     )
 420 LOCAL I%
 430 PROCseek(TR%*2)
 440 PROCset(TR%)
 450 ?X%=DR%:X%?5=3:X%?6=&53:X%?7=TR%:
     X%?8=SC%:X%?9=NR% OR &20
 460 I%=0
 470 REPEAT
 480 E%=FND(10,W%)
```

Program 1. *page 36* ▶



◄ page 35

```
490 I%=I%+1
500 UNTIL E%=0 OR I%>5
510 IF E%<>0 PRINT"Error ";E%;"
    at ";DR%;"/";TR%;"/";SC%:END
520 PROCset(TR%*2)
530 ENDPROC
540
550 DEF FND(T%,W%)
560 LOCAL A%,Y%
570 X%!1=W%
580 Y%=X% DIV 256
590 A%=&7F
600 CALL osword
610 = X%?T%
620
630 DEF PROCseek(T%)
640 ?X%=DR%:X%?5=1:X%?6=&69:X%?7=T%
650 E%=FND(8,0):IF E%<>0 PRINT"Failure
    to seek track ";T%:END
660 ENDPROC
670
680 DEF PROCset(T%)
685 IF (DR% AND 1) R%=&1A ELSE R%=&12
690 ?X%=DR%:X%?5=2:X%?6=&7A:X%?7=R%:X
    %?8=T%
700 E%=FND(9,0)
710 ENDPROC
```

Program 1.

destination drive and uses an operating system call (OSWORD A=&7E) to set the size of the destination drive on the disc by poking the W% buffer, which resides in Basic memory. (This will eventually be written to the disc, freeing the rest of the disc space.)

Then READ40 reads a number of tracks (NT%) from drive DR%, track TR%, starting at sector SC% for NR% sectors and stores them in W%. In this procedure, the track number is multiplied by two (line 430) to simulate a 40-track drive.

WRITE80 simply writes the track buffer to the destination drive without modification.

The function FND, used by the latter two procedures, calls the disc filing system to command the 8271 floppy disc controller chip to perform a variety of functions: it takes two parameters, the command number and an argument.

Errors are trapped in READ40, WRITE80 and SEEK. They produce the standard error codes in the same way as the DFS.

The program will operate on model Bs with series one MOS and any DFS.

This is the 40 to 80 solution, can anybody supply the 80 to 40 answer?

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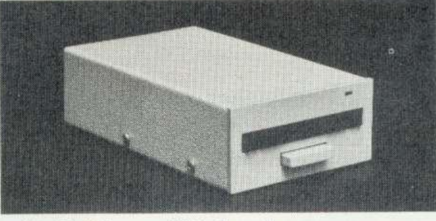
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ELECTRON SON OF BBC MICRO

Paul Beverley finds out what Acorn's new machine can do, and how similar it is to the BBC

WHAT follows is not really a review of the Electron, but rather the results of playing with a field trial machine provided by Acorn. Also, there are one or two details not yet finalised, and no doubt modifications will be made to the operating system before the launch.

Obviously we will make comparisons with the BBC micro, but not with other micros. No doubt there will be plenty of other people to do that! The aim here is to give a few facts.

To say the Electron measures 340 by 160 cm probably does not give you much real idea of its size, but figure 1 might. As you can see, it appears the Electron is all keyboard, and not much else. The size has been kept to a minimum by having an external mains transformer, integral with the mains plug. Unfortunately, this is so large that on some double mains sockets there is not enough room to use the adjacent socket.

Inside the case there are two circuit boards – one for the switched-mode power supply and the other for the computer itself, the two being separated by a partition which gives the case extra rigidity. Power from the transformer enters on the right side, and along the left side are cassette socket and connectors for outputs to an RGB monitor, a black and white monitor, and a colour or black and white television. (The sockets are clearly labelled – on the underside of the case!) The only other output is an edge connector in a recess along the bottom edge of the back of the case.

The main board contains a 6502A microprocessor running at 2MHz, two 16k memory chips (Basic in ROM and operating system in EPROM), four RAM chips (32k total), nine simple TTL chips, a quad operational amplifier chip, a handful of discrete components and last, but not least, a *huge* ULA!

The keyboard is a full QWERTY version, with full depression keys, but they don't seem such good quality as on the BBC micro. There are 55 keys (compared with 73 on the BBC), but they are well used, and the only functions not included are tab and shift lock. What is more, there is an extra facility. Of the 55 keys, 29 can be used for entering whole Basic keywords, such as REPEAT, INPUT, PLOT etc. This is done by the FUNC key, which is used rather like CTRL or SHIFT. For example, <func> A, produces AUTO, <func> C, produces COLOUR, and <func> R, produces RUN with a carriage return.

However, if you have got into the habit of using abbreviations don't worry – they are all exactly the same as in BBC Basic. And the Basic chip bears a remarkable similarity to that in the Beeb. As with the Beeb's function keys, you have the alternative of using them for the entry of single characters, including user-programmed characters.

Although the Electron does not have the ten red function keys, the same facility is provided by using the FUNC key in combination with the number keys 0 to 9. This reduces the key count by 10 and



produces exactly the same effect as the BBC's function keys.

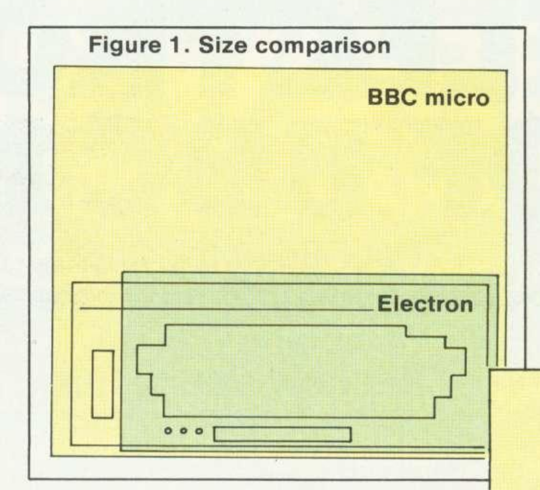
Screen editing is identical to the BBC, using cursor keys along with the copy key, and here again there is a saving on the number of keys. In this case it has been done by combining the cursor and copy keys with the five keys adjacent to them on the BBC. To get the two characters on each of these keys instead of the normal editing functions, they are used in combination with either the SHIFT or CTRL. One minor gripe here is that COPY is above RETURN key, and then, where a BBC user would expect to find COPY is the DELETE key! This can be frustrating, and a menace in an environment where Electrons are used alongside BBC micros.

*KEY10 will program the BREAK key and *KEY11 to 15 the cursor and COPY keys. This means any software written for the BBC which relies on function keys, can run on the Electron. Another single key saving has been made by combining the 0 and @ characters.

One of my main concerns is interfacing, and in this respect I am a little disappointed in the Electron. Apart from the cassette socket and the various output display devices, the only other form of interface is an edge connector which provides address and data lines for hardware, such as a printer interface, user port, Econet interface or perhaps a modem. Unfortunately, no information was given about this in the provisional manual. The only clue is that the operating system can access pages &FC00, &FD00 and &FE00. &FE00 to &FE07 are used for addressing registers in the ULA, but as well as FX calls 150 and 151, they seem to have implemented (but not yet documented) FX calls 146 – 149, associated, in the BBC, with Fred and Jim – the 1MHz bus.

Whilst mentioning the edge connector, it is worth making two comments about its design. First the good news . . . at each end of the recess in the back of the computer is a huge bolthole so add-on units can be securely fixed. Now, the bad news . . . if you leave a metal object lying on the table behind the computer (in my case a jack plug provided with the cassette lead), it can go underneath the edge connector and short out

Figure 1. Size comparison



the power supply! It wasn't until the second time this happened that I realised what was causing the machine's demise.

The power supply is designed so that although it does not seem to suffer any long term damage by being shorted out, it stays dead until left switched off for several minutes.

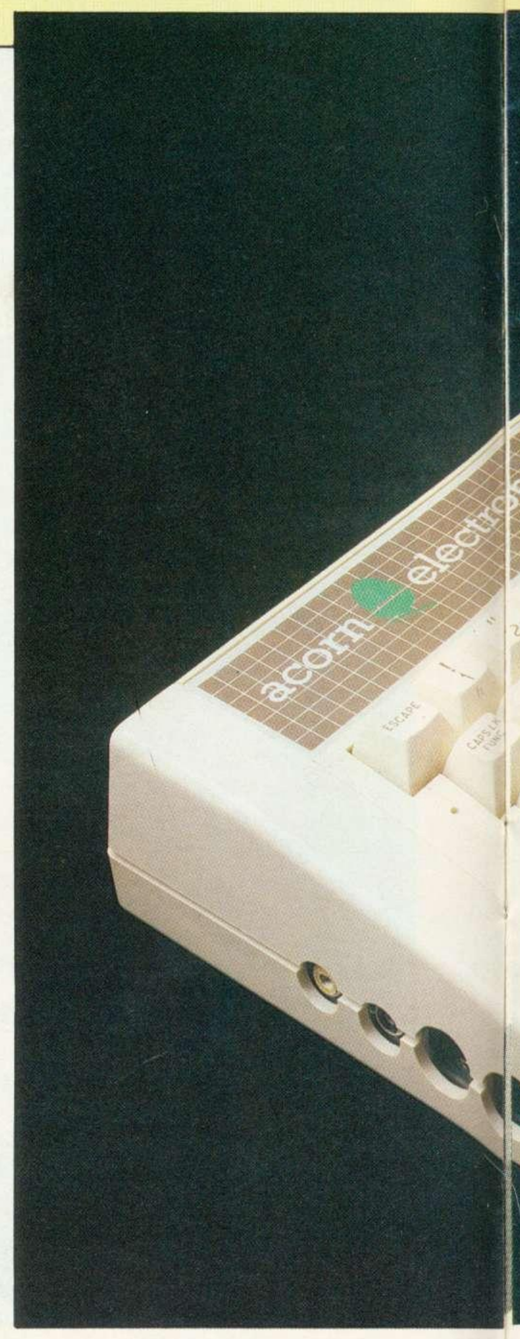
Not surprisingly, the Acorn designers have gone out of their way to make the Electron compatible with the BBC micro. This can be seen by comparing the two memory maps – and they look identical. First, there is 32k of RAM and 32k of ROM. The ROM consists of 16k of Basic and 16k of operating system. Of the RAM, 3¼k is used by the operating system, and ¼k is kept for the user's machine code routines, so Basic programs normally start at &E00 as they do on the BBC. The remaining RAM is used to provide program and data storage and graphics.

The Electron has seven of the eight modes provided by the BBC microcomputer – the only one missing being mode 7 – the teletext mode. The graphics are identical with the BBC (OS 1.2) so that you have at the one extreme mode 0 which provides a resolution of 640 by 256 in two colours, and then trading off the resolution against the number of colours, you can go to mode 2 with a resolution of 160 by 256 in 16 colours. Two of the modes, 3 and 6, are text only, being 80 characters and 40 characters respectively by 25 lines. If you need graphics but only want to use 10k of RAM for the screen then modes 4 and 5 provide either 2 or 4 colours, with a resolution of 320 by 256 or 160 by 256 respectively.

On the BBC micro, graphics are provided by a standard CRT controller chip – the 6845 – plus a ULA to extend the controller's memory range and provide a colour palette. It was this ULA which gave problems in the early stages of development of the BBC micro.

Figure 2. Comparison of speeds of BASIC [cut off]
(Timings are given using the onboard time [cut off]

	BM1	BM2	BM3
BBC micro	0.64	2.8	8.0
Electron	0.86	3.7	10.7
Drop in speed (%)	34	32	34



Acorn's designers were trying to include more and more functions within one ULA, and in the case of the video ULA were pushing it to the limits of its specification by running at 16 MHz to get the necessary resolution in mode 0.

The Electron ULA not only contains the colour palette circuitry but also the CRT controller action of the 6845, although without the 6845's full programmability. For example, there is no facility for sideways scrolling by reprogramming the 6845. This means programs such as *Rocket Raid* and *Planetoid* which rely heavily on sideways scrolling, although they run on the Electron, produce a garbled screen. Also some games such as *Snapper* make use of hardware timers in the second 6522 VIA on the BBC micro and will not run properly on the Electron without external hardware, again since there is no 6522 VIA, and for the same reason, there is no user port. The lack of 6522s also means internal timing has had to be taken over by the ULA. The ULA also contains control circuitry for the cassette interface which makes it a busy little chip! Actually it's not so little – it's a 30mm square 68-lead ceramic package.

SI(using the P.C.W. bench marks.
tim(e clocks.)

3	BM4	BM5	BM6	BM7	BM8
0	8.5	8.9	13.7	21.2	5.0
7	11.4	11.9	18.2	28.1	7.1
4	34	34	33	33	42



The two machines are compatible as far as the cassette interface is concerned, so programs from the BBC can be loaded into the Electron and vice versa. The Electron will not load at 300 baud; it accepts *TAPE3, but continues to load and save at 1200 baud. Once programs have been loaded, many will work directly on the Electron provided they use the operating system commands. (Beverley's on his hobby-horse again!) Hobby-horse or no, if you have written your programs using the operating system commands, they will transfer straight to the Electron without modification! If programs use mode 7, they are run using mode 6 and will usually run out of space because of the 7k difference.

One sad omission is the absence of sideways ROMs, though the operating system software can cope with serial cartridge ROMs. These would presumably be mounted in one of the extension modules. However, it is worth noting that if you take out the Basic chip and put in a different language, the Electron seems quite happy. For example, View and Computer Concepts Beebcalc both run on the Electron, although Wordwise does not since it relies on mode 7.

Where the Electron's hardware does not match up to the BBC, as much as possible has been done to avoid it causing errors. For example, a program which calls for mode 7 doesn't produce 'Bad mode', but sets up mode 6 and does the best it can to obey PRINT instructions. (For example teletext double height characters are printed twice!)

There was little in the field trails manual about FX calls, but a few hours digging un-earthed the calls in figure 2. Naturally those calls concerned with the A to D converters or the RS423 serial interface have not been implemented, but most of the others have. Again, compatibility allows

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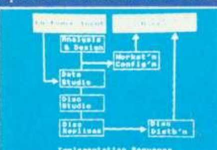
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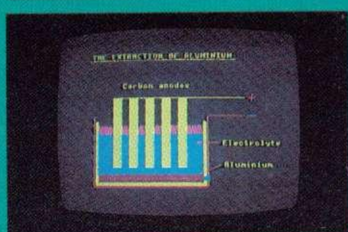
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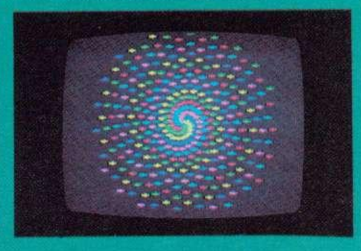
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calls such as *FX2 and *TV to be accepted, but nothing is done with them. (*FX – selecting the output channel works to some extent. That is to say that if you select *FX3,2 it disables the screen, and 3,0 re-enables it.)

Some OSWORD calls are also implemented. Certainly those which access the system time clock, the interval timer and the sound channels all appear to work normally. Also there are all the normal operating system routines such as OSFIND, OSBGET, OSCLI etc. I have not bothered to check these individually since they are called by Basic and therefore must be present for Basic to work properly.

All the VDU driver routines are implemented although VDUs 1, 2 and 3 need additional hardware and software. There are however none of the advanced graphics routines (VDU23,0, etc) used for altering the various registers on the 6845 CRT controller chip, since all these functions have now been incorporated into the ULA. This unfortunately means that although the Electron supports all seven of the modes which used the 6845 it does not allow some of the clever tricks possible on the BBC micro.

However, one of the VDU 23,0 routines has been maintained, and that is for switching the cursor on and off. It has been arranged so existing software runs normally, but when the cursor is switched off and you attempt to do screen editing, you do not get the inverted cursor which moves around the screen for copying various bits, so you have to switch the cursor back on with VDU23;1,1,0;0;0;.

Four sound channels have been incorporated into the ULA, but it will only produce one channel at a time, and the envelope command is more limited. This means programs which call the sound and envelope commands run, but do not sound the same.

As far as speed is concerned, a quick look at the results of running benchmarks (figure 2) will show the Electron aparently to be between 32% and 44% slower than the BBC. This is because of the way memory is arranged. It is too technical to go into, but Acorn has used four 64k x 1 bit chips to make up the 32k RAM to keep down the cost. This means each byte that has to be read from or written to memory has to be dealt with in two, four-bit nibbles. During such RAM access, the processor clock is effectively stretched to 1MHz – the same technique as used on the BBC for the 1MHz bus. Thus if you look at benchmark 8 which deals with arithmetic functions, you will see it is noticeably slower than other benchmarks since it makes so much use of RAM while doing its calculations.

So what about graphics? Yes, you've guessed it – this is where you see why the Electron is less than half the cost of the BBC model B. The speed of the graphics routines is reduced not only because of the slow access to RAM but also because they have done away with the 6845 CRT controller chip (a good example of the so-called 'software/hardware trade-off'). How slow? Well on average, programs with a lot of graphics take between two and three times as long as the same program run on the BBC micro computer. Persian (*User Guide*, p46) for example, takes 108 seconds on the Electron as opposed to 44 seconds on the BBC – a factor of 2.45.

It seems therefore that the Electron is basically a cut-down version fo the BBC model B. That is to say it has 32k of RAM, but does not have any of the following facilities:

- RS423 interface,
- analogue to digital converters,
- 1 MHz interface bus,
- Tube interface,
- printer port,
- user port,
- sideways ROMs
- 300 baud option on cassette interface,
- mode 7

However, it does have the added facility for single key entry of 29 different basic keywords, in addition to the 10 function keys, and the programmable cursor, copy and break keys. Also, all of the above items, except the last two, can be added externally says Acorn.

*FX	Function
0	Report OS version
3	Select output stream
4	Change effect of copy and cursor keys
9	Set flash rate (mark)
10	Set flash rate (space)
11	Auto repeat delay time
12	Auto repeat interval time
13	Enable various events (all work except ADC and RS423 events)
14	Disable various events
15	Flushes a given class of buffer
18	Empties user key buffer
19	Waits for vertical sync pulse
117	Reads the VDU status byte in the X register
118	Uses the sign bit of X to indicate if CTRL is pressed
129	Read a key with a time interval
130	Read machine high order address
131	Read top of RAM address
132	Read bottom of display RAM address
133	Read lowest address for a particular mode
134	Read text cursor position
135	Read character at text position
136	Motor control
137	Insert character into a buffer
138	File options
145	Get character from a buffer
146	Read from page &FC
147	Write to page &FC
148	Read from page &FD
149	Write to page &FD
150	Read from page &FE
151	Write to page &FE
181	Read flash (space) time (set by FX10)
182	Read flash (mark) time (set by FX9)
211–214	Set effects of CTRL-6
225	Set base for f0 – f9
226*	Set base number for <func> A – P
227*	Set base number for <func> Q – /
242	Reads cassette motor status

Figure 3. List of FX calls which work on Electron OS 0.31 (* – calls which are extra to the BBC OS).

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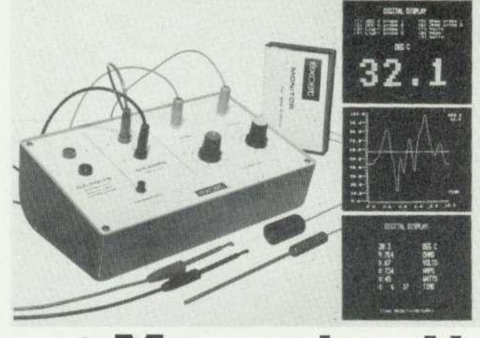
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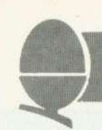
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TAKE a blank formatted disc, type in listing 1 and run it. Note that you get an error. Wipe the disc clean with *ENABLE followed by *DESTROY *.*.

Now change line 30 to PROCTEST ("TEST2", 20) and re-run. No error this time.

The error in listing 1 can be explained as follows. When TEST1 is saved, 60 disc sectors are rserved for it. However, it takes up very little space. When ANOTHER is saved, it is placed in the sector directly following the end of TEST1.

When an attempt is made to save new data under the old file name TEST1, the disc operating system automatically allocates the space occupied by the old data in TEST1. However, this is less than required for the new data, and so a 'can't extend' error results. Changing line 60 to:

IF D%=10 THEN F=OPENOUT(A$)
ELSE F=OPENIN(A$)

(or in Basic 2, OPENUP(A$)) doesn't help.

This problem is most likely to occur when the program user is allowed to name his own files. There are two solutions. First, don't allow the user to save data under a file name which already exists. Listing 2 illustrates how to do this.

Second, delete the file with the same name before saving the data. Listing 3 illustrates this approach.

Some commercial programs may not cater for this problem. When testing a piece of software which allows you to name your own disc files, test it in the manner of listing 1.

SYNCH DELAY BY CHRISTOPHER FEWSTER

£10

IN ANSWER to Paul Hopkins (April Forum), listing 4 will cause the computer to wait until the next synchronisation pulse occurs.

However, on operating systems after OS 0.1, this can be accomplished by a call to OSBYTE with the accumulator containing 19. The program is run and then, when the routine is needed, CALL or JSR WSYNCH. This routine works on the principle that whenever a vertical synchronisation pulse occurs, bit 1 of the register at &FE4D is set to 1 (bit 0 and bits 2-7 signal other interrupts). When WSYNCH is called this bit is continually tested (lines 60 and 70) until a synchronisation pulse is detected. As there are 50 of these each second, the routine operates very quickly.

If notification is required of each pulse, then, as far as I am aware, either OS 1.0 or 1.2 is required. The pulses can then be detected using even handling. After *FX14,4 the operating system indirects via &220 whenever a vertical synchronisation pulse is detected. Using the guidelines set out on page 465 of the *User Guide* the necessary routine can be written and the contents of &220 and &221 altered to point to its start.

```
10PROCTEST("TEST1",10)
20F=OPENOUT("ANOTHER"):PRINT#F,"*":CLOSE#F
30PROCTEST("TEST1",20)
40END
50DEF PROCTEST(A$,D%)
60F=OPENOUT(A$)
70FOR I%=1 TO D%:PRINT#F,STRING$(D%,"*"):PRINTI%:NEXT
80CLOSE#F
90ENDPROC
```

Listing 1.

```
10ON ERROR IF ERR=&D6 THEN 40 ELSE<Rest of error trapping>
20INPUT'"Name of file",A$
30PROCCHECK(A$):PRINT"File already exists":GOTO20
40REM Rest of program
50STOP
1000DEF PROCCHECK(A$)
1010$&CE0="ACC."+A$:X%=&E0:Y%=&C:CALL&FFF7
1020ENDPROC
```

Listing 2.

```
10ON ERROR IF ERR=&D6 THEN 40 ELSE <Rest of error trapping>
20INPUT'"Name of file",A$
30PROCDELETE(A$)
40REM Rest of program
50STOP
1000DEF PROCDELETE(A$)
1010$&CE0="DEL."+A$:X%=&E0:Y%=&C:CALL&FFF7
1020ENDPROC
```

Listing 3.

```
10  P%=&D01
20  [
30  .WSYNCH
40  SEI
50  .LOOP
60  LDA&FE4D
70  AND#2
80  BEQ LOOP
90  CLI
100 RTS
110 ]
```

Listing 4. Synchronisation delay

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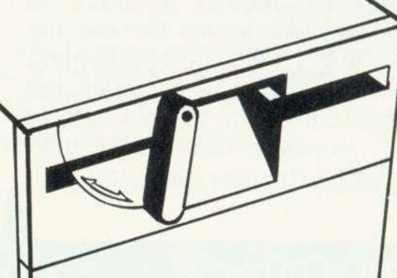
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KEEPING SECRET DATA BY NIGEL BEASLEY

WHEN writing quiz programs for schools or adventure games it is annoying if the user can simply look at the data statements and work out the answers. The following procedure will cause the information following a DATA statement to disappear when the program is listed.

When writing the program, put a space as the first and last pieces of data in the statement, eg:

10 DATA (space), Oxygen, Xenon, 3, (space)

When the program is complete type in listing 5 and press return after each line.

Then list your program, and the text or figures following the data statement will have disappeared! The data can still be read as normal, but take care because the first and last bit of data in each line will be the instruction to turn output to the screen on and off. This can be overcome by simply reading these commands into a string variable and ignoring them.

The program works by putting VDU control codes into the place of spaces, which turn the output to the television or monitor on and off. VDU 21 turns output off and VDU 6 restores printing (*User Guide* pages 380, 382). The correct place to put the commands is found when a unique pattern of numbers occurs in memory and the commands are inserted. The code to do this is put high in memory to avoid interference with other programs.

Listing 5. Hiding data

```
MODE 7
T%=TOP
P%=PAGE
PAGE=&7000
NEW
10 FOR A%=P% TO T%
20 IF ?A%=220 AND
  A%?1=32 THEN A%?1=21
30 IF ?A%=32 AND
  A%?1=13 THEN ?A%=6
40 NEXT
RUN
PAGE=P%
```

INVISIBLE KEYS BY BOBBY HESSELBO

£5

FUNCTION keys can be programmed to carry out a set of instructions without them being seen on the screen. Precede the instructions with ¦E¦R¦C¦@ and end them with ¦D¦M. For example try

```
*KEY0¦E¦R¦C¦@ X%=X%+1:
   P.X%¦D¦M
```

in any graphics mode.

The control codes are equivalent to VDU5 : GCOL3,0 and VDU4. Hence, text is plotted in logical colour zero in the exclusive – OR mode.

TAPING SCREENS BY ANTHONY ROBINSON

£5

IF YOU have created stunning artwork on the BBC micro and want a permanent record, the simple routines below will load and save a screen onto tape.

```
10 REM LOAD SCREEN
20 VDU 21
30 *LOAD SCREEN
40 VDU 6

960 REM SAVE SCREEN
970 VDU 21
980 *SAVE SCREEN SSSS
   FFFF
990 VDU 6
```

Where SSSS, the start address, is the value of HIMEM in hex (given by PRINT ~ HIMEM).

For the different modes, the value of SSSS is given by:

Mode	Model B	Model A
0,1,2	3000	–
3	4000	–
4,5	5800	1800
6	6000	2000
7	7000	3000

For a model A, replace FFFF by 4000, and on a model B by 8000.

The screen saving routine should be placed in a Basic program to run once the screen has been completed. The program will pause at line 980 until the return key is pressed, so allowing the tape to be positioned before recording starts.

VDU 21 and VDU 6 disable, and then enable the VDU drivers so the message 'record then return' and the file name are not printed on the screen, or dumped to tape.

KEYS AND BUFFERS BY ALEXANDER SELBY

£5

THE *User Guide* says the extremely powerful facility of inserting keys into the buffer is limited to the 1.0 operating system, but using listing 6, keys can be insered on a 0.10 machine.

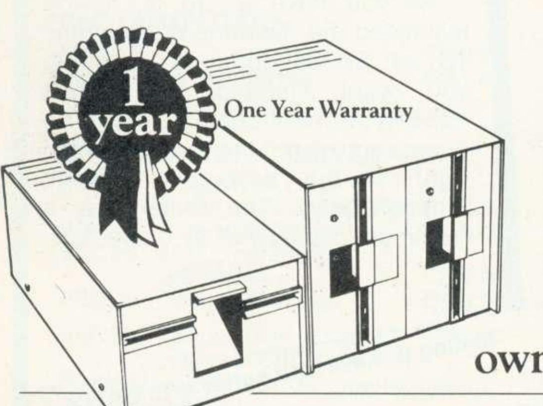
All you have to do is, having initialised the machine code in line 10, set $&930 equal to the string you want inserted, and CALL INSERT. Control characters can be accessed using the ¦ on the top right of the keyboard as with function keys. The buffer has a maximum capacity of 31 characters.

Listing 6. Keys into buffer with OS 0.1

```
10 P%=&900:[OPT2:.INSERT:LDX#0:
   .L%:LDA&930,X:CMP#13:
   BNE P%+3:RTS:CMP#124:BNEP%+8:
   INX:LDA&930,X:
   AND#31:STX&92F:LDY#0:
   JSR&EF41:LDX&92F:
   INX:JMPL%:]
20 $&930="GOTO20¦M":CALL INSERT
```

Microware presents the latest news on BBC.

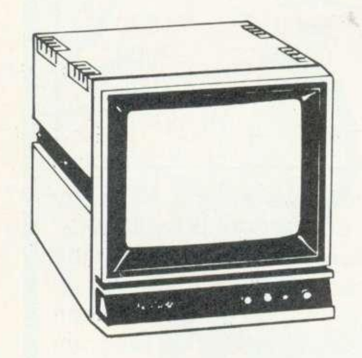
N.B. 40/80 Format Switch – call for information



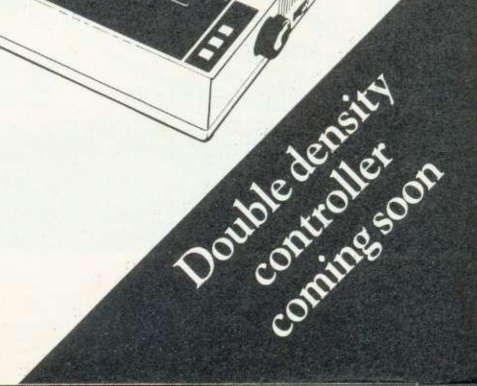
Reports are coming in that Microware, the authorised dealers for BBC and Epson, are being inundated with orders and enquiries from BBC micro owners. It is believed that this unprecedented activity is the result of the wide range of products on offer and the competitive pricing policy of the company. The most dramatic recent development is the exclusive ZL range of floppy drive sub-systems.

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ZL242	1Mb	400K	124	415.00	5
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ZL291	1Mb	400K	62	355.00	5
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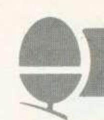
Further news items, of interest to BBC micro users, are the Hantarex monochrome monitors with green or amber screen options. A full range of Epson printers are available from stock, including the RX 80 at £295 and the FX 80 and MX 100. High quality Dysan and Memorex floppy diskettes start at £1.62 and are always available.



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COLOUR-FILL GRAPHICS

Jim McGregor and Alan Watt explain colour fill routines and give several examples, including the new PLOT commands

Interactive computer painting is much in vogue in advertising and television where expensive hardware is used to generate images from scratch, or enhance them. The technique uses a lightpen, or similar device, to select colour from a menu and 'paint' on the screen. In this sense, the lightpen replaces the artist's brush, and can even simulate the texture of brushstrokes.

All this may sound very exotic and expensive, but the BBC micro can imitate these systems. The basic requirements of interactive painting are: to define or draw outlines (*Acorn User*, June); to colour these regions from a menu of colours.

The colour photos with this article show convoluted regions being filled by different colour fill algorithms. Another requirement is to be able to extend the colour range available on a device by mixing or 'dithering' colours, as shown in the dragonfly illustrations. A later article will deal with mixing and drawing using a joystick to produce these pictures.

This article will examine how to fill regions using just flat colour. Four algorithms are presented, two use a queuing technique and two use recursion (July issue). It is worth reiterating that BBC Basic is, as far as we are aware, the first dialect of this language to implement recursion.

Filling the interior of a closed region can be done using the triangular fill facility (PLOT 80-87). However, not all closed figures can be easily filled using this as the computer must have detailed knowledge of the shape of the region being plotted. For example, to fill any regular or irregular polygon, given an ordered sequence of vertices, we can use the simple expedient of moving to any point within the interior before plotting to each vertex (figure 1). Colour fill then proceeds at the same time as tracing the boundary. Life becomes more complicated, however, when such a figure contains a hole or concavities. We end up with a filling technique that depends on the shape of the figure. Imagine

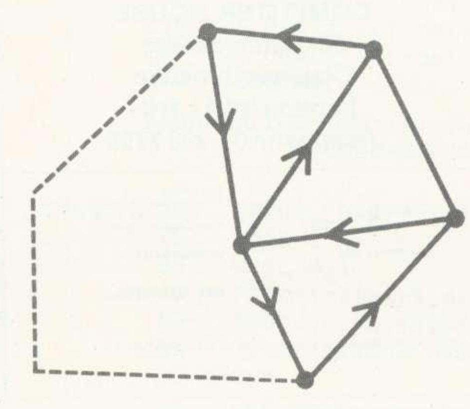


Figure 1. Plotting and filling a polygon using triangles

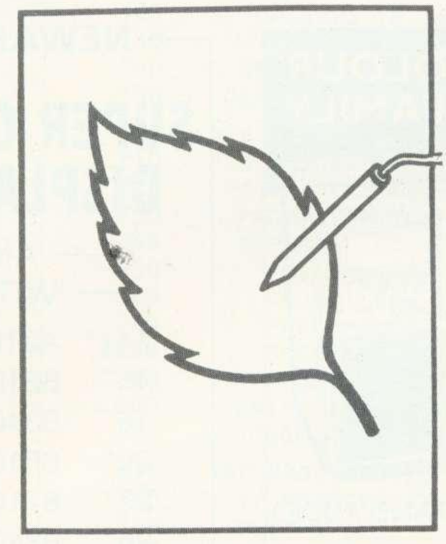


Figure 2. Colour fills must cope with convoluted regions

trying to define a sequence of triangle filling operations that would colour the castle pictured.

Anyway, in interactive painting the outline will have been drawn before the colour fill takes place and clearly we want to be able to fill any region no matter how convoluted (figure 2). Such algorithms allow us to draw a closed region and select a colour to fill it.

Algorithms that fill the interior of any closed figure are sometimes called 'flood-fill' algorithms and work by assuming the region to be filled is delineated by a boundary of pixels in a non-background colour and that the interior of the region is '4-connected'. This means all pixels within the region can be reached one from the other by a sequence of any of the movements up, down, left and right.

There are two approaches to this problem; one is recursive, and the other uses a FIFO (first in, first out) queue. The simplest colour fill algorithm we can design is recursive. We start from an arbitrary point working outwards to adjacent points, eventually visiting the whole region (algorithm 1). If, however, you insert the procedure in a program, it will work only for very small regions. For larger regions, the program will terminate with the error message 'no room' because a long sequence of recursive procedure calls have been entered and not yet terminated.

To see how this happens, look at the configuration of pixels shown in figure 3. If we start the fill process by calling PROCfillfrom with parameters that specify pixel 1, the tree of procedure activations shown in figure 4 is created. This process will continue and as the pixels in the region are visited, the tree of procedure activations will get deeper and deeper. A procedure call will be terminated only at a dead end, for example at pixel 4. Each time a procedure is activated, storage space is used up for holding parameters, local variables and a record of where to return to when the procedure is terminated. This space is freed only when the procedure terminates.

There is thus a limit to the depth to which the recursion can be extended, and for a region of any size the limit will soon be encountered. Notice also that in this example when a long chain of recursive calls is eventually terminated, most of the other recursive calls that then take place will be unnecessary and will terminate immediately. This redundancy is, however, necessary if

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the algorithm is to cater for a convoluted region. With a large memory the simple recursive algorithm might be usable, but on a micro, it is unsatisfactory.

Algorithm 2 is non-recursive and uses a FIFO queue. This is shown in the course of filling our castle, although we have only included a pair of circles in the program that drives the algorithm.

Filling proceeds with 'diagonal wavefronts' and the algorithm is a little more complex than the first. PROCfillfrom is initiated from a start point which is coloured and added to a queue (by calling PROCfill). PROCfillfrom then repeatedly takes the first point from the queue and examines each of the neighbouring N, S, E and W points (by calling PROCfill for each in turn). Each time PROCfill is called, it colours the point given (if not already coloured) and adds that point to the end of the queue. Adding to the queue in this way ensures the point will subsequently be removed from the queue and its neighbours examined.

The reason the queue is made a FIFO is to ensure duplicated points are quickly removed to prevent the queue becoming too large. If for example we made the queue an ordinary stack (LIFO or last in first out) it would gradually grow and run out of memory.

For the queue, we use two arrays, one for x-coordinate and one for y-coordinates. Two variables indicate the positions of the 'first' and 'last' items in the queue. The arrays are treated as circular, so when the end of the queue reaches the end of the arrays, the queue is 'wrapped around' and continued into the free space at the start of the arrays. PROCfillfrom repeatedly takes the next point from the queue until it is empty. Although algorithm 1 only works for small regions and algorithm 2 is slow, both are worthy of study because of their simplicity.

A common provision in graphics systems that operate with a raster scan display (eg a TV) is a horizontal fill facility. This will typically be given the (x,y) coordinates of a point and will colour-fill pixels to the left and right of the given pixel as long as these pixels are in the background colour.

On the BBC micro, the 0.1

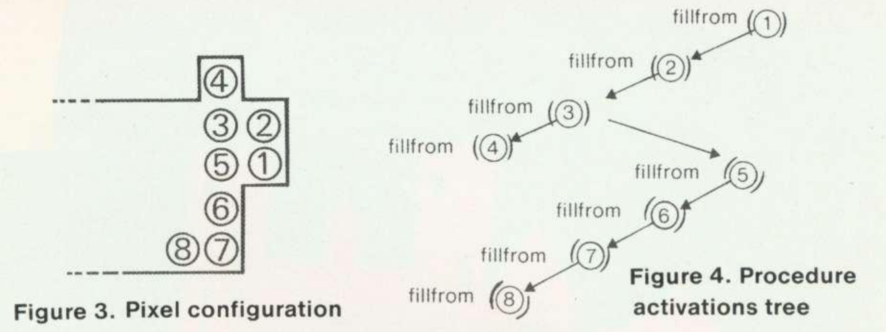


Figure 3. Pixel configuration

Figure 4. Procedure activations tree

```
200  DEF PROCfillfrom(x,y)
210    IF POINT(x,y)>0 THEN ENDPROC
220    PLOT 69,x,y
230    PROCfillfrom(x,y+4)
240    PROCfillfrom(x,y-4)
250    PROCfillfrom(x+4,y)
260    PROCfillfrom(x-4,y)
270  ENDPROC
```

Algorithm 1. Simple recursive colour fill – only suitable for large machines

```
 10  INPUT "RADII",r1,r2
 20  MODE 1
 30  GCOL 0,1
 40  PROCcircle(r1,640,512)
 50  PROCcircle(r2,640,512)
 60  PROCfillfrom(640+(r1+r2)/2,512)
 70  END
 90  DEF PROCcircle(r,xc,yc)
100  LOCAL t
110    MOVE xc+r,yc
120    FOR t=10 TO 360 STEP 10
130      DRAW xc+r*COS(RAD(t)),yc+r*SIN(RAD(t))
140    NEXT t
150  ENDPROC
200  DEF PROCfillfrom(startx,starty)
210  DIM queuex(500), queuey(500)
220    first=1 : last=0
230    PROCfill(startx,starty)
240    REPEAT
250      PROCunqueue
260      PROCfill(x,y+4)
270      PROCfill(x,y-4)
280      PROCfill(x+4,y)
290      PROCfill(x-4,y)
300    UNTIL first=(last+1) MOD 500
310  ENDPROC
330  DEF PROCfill(x,y)
340    IF POINT(x,y)>0 THEN ENDPROC
350    PLOT 69,x,y
360    PROCqueue(x,y)
370  ENDPROC
390  DEF PROCqueue(x,y)
400    last=(last+1)MOD500
410    queuex(last)=x
420    queuey(last)=y
430  ENDPROC
450  DEF PROCunqueue
460    x=queuex(first)
470    y=queuey(first)
480    first=(first+1)MOD500
490  ENDPROC
```

Algorithm 2. Single pixel FIFO queue



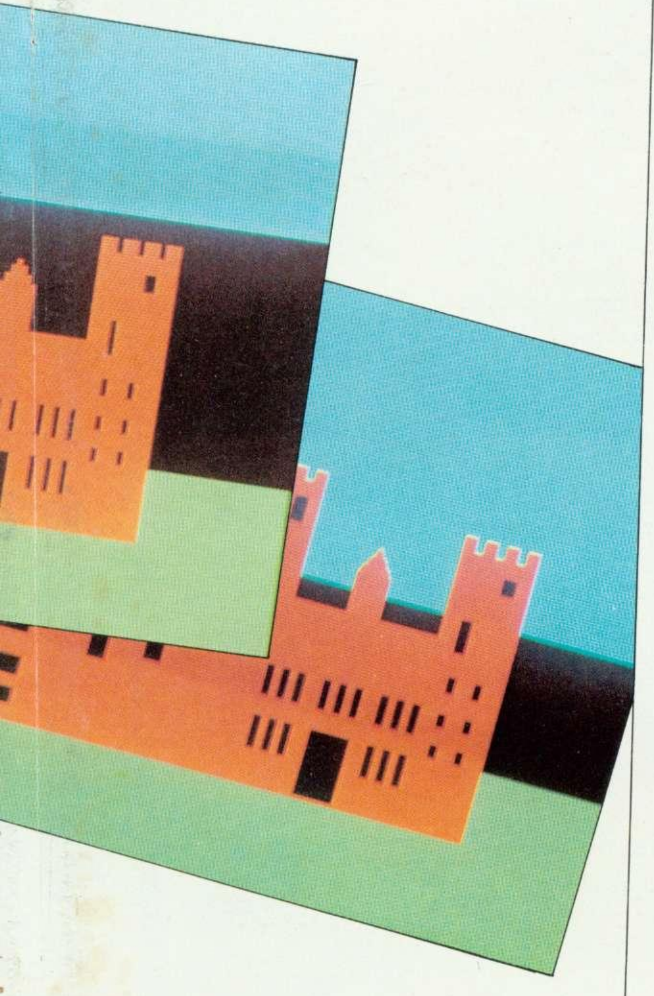
Mixing colours extends the range available.
In this case, three shades have been mixed in mode 0

operating system did not provide a horizontal fill, but this was rectified in later versions with a new set of PLOT instructions.

Algorithm 3 uses recursion again and also uses the new feature of OS 1.2. Because the recursion operates on 'units' of lines rather than individual pixels, the algorithm can be implemented on micros. Note from the colour illustration that the filling now proceeds with 'horizontal wavefronts'. As we have seen already, the simple recursive approach leads to problems involving the depth of the recursion and the queue method is preferable. However, a recursive approach is possible for moderately sized regions. Although this also involves a new problem with recursion, this can be easily overcome. Incidentally, you should not be impatient if this algorithm appears to stop without filling the complete region. The recursive procedure calls take time to 'unwind'.

First, we present a Basic procedure that implement a horizontal fill without the new PLOT commands. The method is vital for OS 0.1 and can be seen as an explanation of using the new PLOT facilities presented later.

A call of PROCfillalong will first colour-fill to the right of the given pixel until a non-background point is encountered. The same is done to the left. Both scans are carried out using the subsidiary procedure PROCdirectionfill whose parameter 'dir' indicates the direction of the scan. As a result of calling PROCfillalong, the two non-local variables 'leftx' and 'rightx' are set to values indicating the extent of the strip that was filled. The value of 'xstep' will indicate the width of a pixel which will depend on the graphics mode. For example, in mode 1, 'xstep=4'. PROCfillalong is called from PROCfillfrom which is given a point, and starts by filling



These pictures show a complete colour fill; algorithm 2 in action (note diagonal wavefronts); algorithm 3 as sky is coloured with horizontal wavefront; algorithm 4 (note difference between action of 3 and 4)

the horizontal strip in which the point specified by its parameters lies. It then calls itself recursively to fill from each pixel above and below the strip just filled. In this procedure we have committed the venial sin of using a GOTO. We would like to write the main loop as:

```
FOR scanx = leftx TO rightx
   STEP xstep
   PROCfillfrom(scanx, y + ystep)
   PROCfillfrom(scanx, y – ystep)
NEXT scanx
```

but this will produce the error message 'too many FORs'. This is because a recursive procedure call

```
200  DEF PROCfillfrom(x,y)
210  LOCAL leftx,rightx,scanx
220    IF POINT(x,y)>0 THEN ENDPROC
230    PROCfillalong(x,y)
240    scanx=leftx
250      PROCfillfrom(scanx,y+ystep)
260      PROCfillfrom(scanx,y-ystep)
270      scanx=scanx+xstep
280    IF scanx<=rightx GOTO 250
290  ENDPROC
300  DEF PROCfillalong(x,y)
310  LOCAL nextx
320    PROCdirectionfill(x,y,xstep)
330    rightx=nextx-xstep
340    PROCdirectionfill(x,y,-xstep)
350    leftx=nextx+xstep
360  ENDPROC
370  DEF PROCdirectionfill(x,y,dir)
380    nextx = x
390    REPEAT
400      PLOT 69,nextx,y
410      nextx=nextx+dir
420    UNTIL POINT(nextx,y)>0
430  ENDPROC
```

Algorithm 3a. Horizontal line fill using recursion

```
300  DEF PROCfillalong(x,y)
310    PLOT 77,x,y
320    X%=CPblock : Y%=CPblock DIV 256
330    A%=&0D : CALL &FFF1
340    leftx=(!CPblock AND 65535)
350    rightx=(!(CPblock+4) AND 65535)
360  ENDPROC
```

Algorithm 3b. Using the new PLOT77 command in PROCfillalong



is appearing inside a FOR statement and any FOR statement entered during a recursive call behaves as if it was inside the outer FOR statement. The FOR nesting limit is 10 which is soon encountered. Also presented is an alternative version of PROCfillalong that uses PLOT 77 for horizontal fill, now described. The statement PLOT 77, x, y scans left and right from the pixel specified by x and y until it reaches the last background point in both direcions. A line is drawn between the two points reached. The rightmost point becomes the 'current graphics point', and the leftmost one the previous graphics point. We now need to set 'leftx' to the x-coordinate of the previous graphics point and 'rightx' to the x-coordinate of the current graphics point. For this we use the OSWORD call at lines 320 and 330. This uses a block of store declared at the start of the program by:

```
5 DIM CPblock 8
```

You need not understand the details of OSWORD. The above version of PROCfillalong is exactly equivalent to that described earlier, although faster.

It is worth mentioning briefly another PLOT command that could be used to speed up execution of the loop in PROCfillfrom (lines 250 to 280). The statement PLOT 92, x y searches pixels to the right of (x,y) for a background point and sets the last non-background point reached as the current graphics position. Use of this in the last algorithm would reduce the delays while the recursion 'unwinds'.

Finally, note that all recursive fill algorithms can run out of room for large or highly convoluted regions. The horizontal fill methods described here could all be reorganised to use a queue. This approach is taken in algorithm 4 which also makes use of PLOT 92. Note the difference in filling patterns between algorithms 3 and 4.

McGregor and Watt's new book, *The BBC micro book: Basic sound and graphics* has now been published by Addison-Wesley at £7.95

Algorithm 4. Using horizontal line fill and new PLOT commands

```
  5 DIM CPblock 8
  6 DIM fromxq(100),toxq(100),yq(100)

200 DEF PROCfillfrom(x,y)
210 LOCAL leftx,rightx,nextx,backx
220   IF POINT(x,y)>0 THEN ENDPROC
230   first=1 : last=0
240   PROCfillalong(x,y)
250   PROCqueue3(leftx,rightx,y)
260   REPEAT
270     PROCunqueue3
280     PROCcheckalong(y+ystep)
290     PROCcheckalong(y-ystep)
300   UNTIL first=last+1
310 ENDPROC

320 DEF PROCcheckalong(y)
330 LOCAL nextx
340   IF POINT(fromx,y)=0 THEN nextx=fromx
      ELSE PROCfindback(fromx,y):nextx=backx
350   IF nextx>tox THEN ENDPROC
360   REPEAT
370     PROCfillalong(nextx,y)
380     PROCqueue3(leftx,rightx,y)
390     PROCfindback(nextx,y)
400     nextx=backx
410   UNTIL nextx>tox
420 ENDPROC

430 DEF PROCqueue3(fx,tx,y)
440   last=(last+1)MOD 100
450   fromxq(last)=fx : toxq(last)=tx
460   yq(last)=y
470 ENDPROC

480 DEF PROCunqueue3
490   fromx=fromxq(first) : tox=toxq(first)
500   y=yq(first)
510   first=(first+1)MOD 100
520 ENDPROC

530 DEF PROCfillalong(x,y)
540   PLOT 77,x,y
550   X%=CPblock : Y%=CPblock DIV 256
560   A%=&0D : CALL &FFF1
570   leftx=(!CPblock AND 65535)
580   rightx=(!(CPblock+4) AND 65535)
590 ENDPROC

600 DEF PROCfindback(x,y)
610   PLOT 92,x,y
620   X%=CPblock : Y%=CPblock DIV 256
630   A%=&0D : CALL &FFF1
640   backx=(!(CPblock+4) AND 65535)+xstep
650 ENDPROC
```

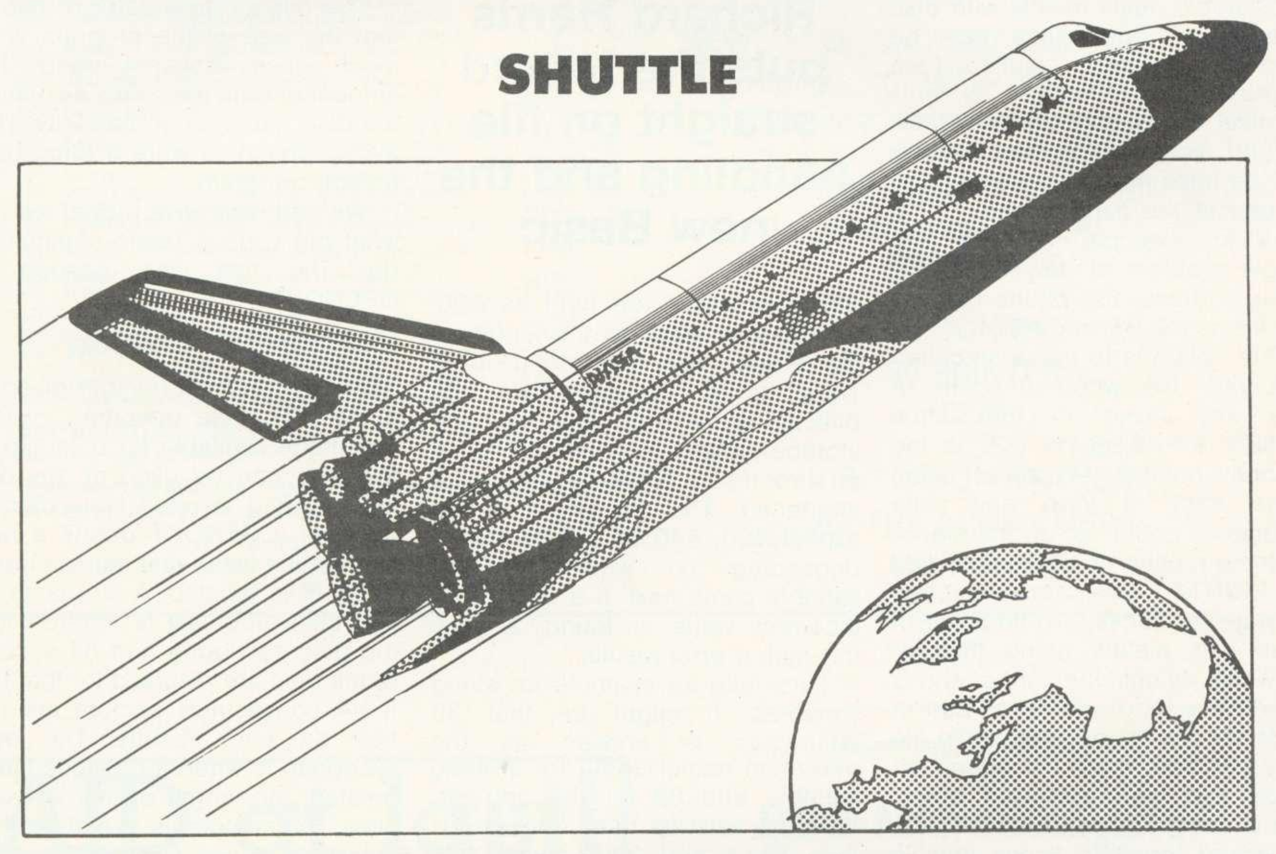


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The simulation may be started at one of three points in time: either at take off, at a point where the Columbia is in a stable orbit round the earth, or finally, prior to landing. Measurements of speed, fuel and so on may be selected for either Metric or Imperial measurements. All of the physical forces which acted upon the actual flight are taken into account. One departure from fact has been included in that the two solid fuel rockets have had their thrusts increased from 26 to 36 million Newtons so as to give the pilot an increased latitude for error. In other words to make the take off easier.

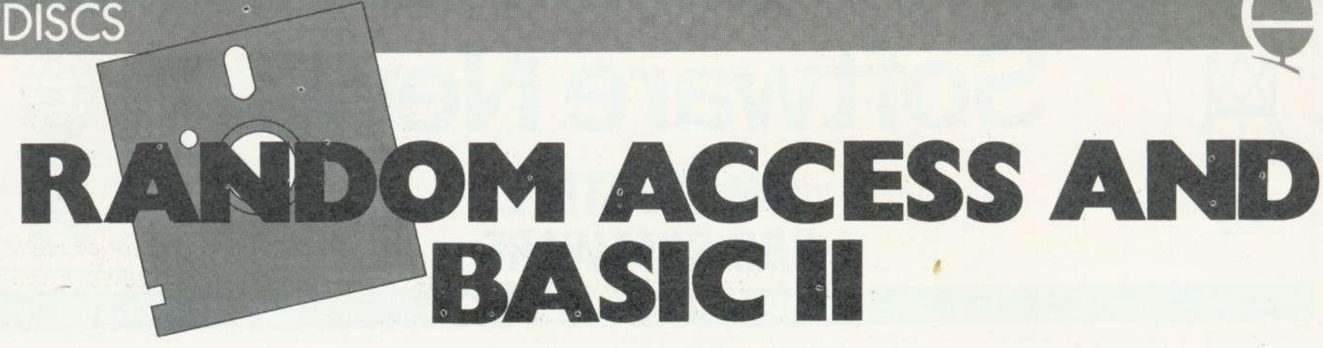
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RANDOM ACCESS AND BASIC II

Richard Harris puts the record straight on file handling and the new Basic

THIS article deals mainly with disc systems. Although tape can be used to hold data, it suffers from several failings. First, it is only practical to use one file at a time. Second, speed of access is slow and, perhaps most importantly, only sequential files can be used.

As an example, consider the simple problem of how to hold a name, address, and phone number in a file as A$, B$, and A%.

One option is to use a so-called sequential file, where the sets of data are saved in turn: thus PRINT# X%,A$,B$,A%. (X% is the channel number explained later.) Some form of loop and data statements could set up the file, or a simple routine of inputs, followed by PRINT#. This, however, has several drawbacks. To find one of these sets means going through the whole lot until the correct one is found. Changing one set or part of a set causes chaos –the whole file needs to be loaded, the correction made, and then all saved again. This is necessary because the data is packed together; if one item is lengthened it will overwrite the next, if it is shortened, an error will occur when trying to read the next item. Simple variables such as A$ are no longer acceptable; to hold all the data in memory, dimensioned variables are needed, with a dimension at least equal to the number of sets of data.

This last point moves us to another problem, memory space. A lengthy program, one with a lot of data, will soon run out of memory in anything other than mode 7. But there is a way round many of these problems – random access files.

Random access files store data on the disc in a set format. This is established in advance, usually based on the longest likely string. Consider how data is stored on a disc. Real variables (eg A, PHONE) are stored in six 'bytes', &FF, followed by the five bytes of its value. Integer variables are stored as five bytes, &40, plus the four byte value. Thus both forms of numeric variable are of fixed length.

String variables are held as &00, then a byte equal to the length of the string, then the string itself. Thus string variables are the difficult ones! Note that it is the storage pattern which would cause an error if sequential file strings are shortened. The interpreter would expect &00, &40 or &FF to follow, depending on which sort of variable came next. If a byte of an incorrect value is found, a 'type mis-match' error results.

Let's take an example for string variables. It might be that 30 characters is chosen as the maximum name length for a string variable and 80 for the address. With the sets we need, the strings take 80+2 and 30+2, whilst the number takes five bytes. This is a total of 119 bytes per set – not ideal, but more on that later.

Now for the most important feature of random access files. It is possible to move a pointer to any position within that file, and load data from that point; this assumes the first byte pointed to is the correct one of &00, &40 or &FF as previously explained. Thus any one set can be picked out by moving the pointer in multiples of 119, starting at 0, not 1. Indeed only one item need be read, if the pointer is moved a further 32, then 82 bytes. Just as important is that any one item can be changed, by moving the pointer to the correct point and printing the new value. Numeric variables are no problem as long as a real variable is not written to a place formerly an integer! The only proviso is that strings do not exceed the set maximum length. If they are shortened no problems arise; the length byte is changed accordingly.

The overall advantage of this is that the size of the program is of much less concern, and the amount of data irrelevant, assuming the disc has enough capacity. This allows space to write a long 'user friendly' program.

We can now have a brief look at what the various Basic commands do. The first one needed is OPENOUT;

```
X%=OPENOUT("address")
```

X% is the channel number given to a file which the operating system has made available for data. Up to five files can be used at any one time – trying to open more causes an error. OPENOUT opens a new file and if a file of that name already exists, it is deleted. A file name (in this case address) is entered into the disc catalogue and 64 sectors of the disc are reserved for that file. If 64 consecutive sectors are not free an error results. The only exception is when a previous file is deleted; the length of that is used. Now, 64 sectors is equal to 16k bytes, so if two files are opened, they will be 64 sectors apart. Note, however, that as soon as the file is closed any unused sectors of those 64 are free for other files, more on this later.

OPENOUT also sets two further Basic keywords, PTR# and EXT#;

```
PTR# X%=119*n
length%=EXT# X%
```

X% is again the channel number. PTR# is how the pointer referred to earlier is controlled. Thus if n=1 in the above example, the pointer will be moved to byte number 119 (the 120th byte, since 0 is the first). EXT# holds the current length of the file; after OPENOUT it will be 0, since no data has been saved. It is *not* set to the end of 64 sectors; they are only reserved for use if wanted. Thus PTR# is used to move around random access files, whilst EXT# can rest whether the end of a file has been reached, or will be reached. For example:

```
IF (PTR# X%)+119 > EXT# X%
  THEN . . .
```

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```
 10 DEF PROCsave(L%)
 20 LOCAL J%,K%
 30 RESTORE 120
 40 FOR J%=1 TO 8
 50   READ K%:PTR# X%=L%+K%
 60   PRINT# X%,A$(J%)
 70   NEXT
 80 PTR# X%=L%+196
 90 PRINT# X%,A%(1),A%(2),A%(3),A%(4)
100 PRINT# X%,$H%:PTR# X%=L%+251:PRINT# X%,0
110 ENDPROC
120 DATA 0,17,29,46,148,162,176,186
130
140 DEF PROCload(J%)
150 LOCAL K%,L%
160 RESTORE 120
170 FOR L%=1 TO 8
180   READ K%
190   PTR# X%=J%+K%
200   INPUT# X%,A$(L%)
210   NEXT
220 PTR# X%=J%+196
230 INPUT# X%,A%(1),A%(2),A%(3),A%(4),$H%
240 ENDPROC
```

Listing 1.

Another keyword is provided to detect the end of a file, EOF#; eg

REPEAT . . . UNTIL EOF# X%

EOF# returns a true value when the end of the file is reached, otherwise a false value is returned.

A further variety of OPEN is available, which seems to be the cause of most confusion, called OPENIN. Note that OPENUP in Basic II is exactly the same as OPENIN in Basic I. Basic II has also got OPENIN, but with a different meaning. First, OPENIN/OPENUP again assign a channel number to the named file; they do not create a new file. Each of these commands allows previously-saved data to be read *or* changed. They also allow extra data to be added to the end of the file. OPENIN sets PTR# to 0 but EXT# is now set to the length of the file.

In theory there are no restrictions on extending a file except the size of the disc. In practice, a file can only be extended up till the next one. If a program is saved immediately after a data file, no extension is possible unless the program is deleted. If unlimited extension is needed, a blank disc should be used initially, and nothing else saved on it (or *COMPACT used). If more than one file is needed, all should be OPENOUTed together (which will space them 64 sectors apart) and then nothing else put on the disc. Larger files can be set up with *SAVE (DFS manual).

OPENIN in Basic II only allows reading; changing or adding to the file is prevented.

The last few commands are the easiest to follow. They allow reading and writing to the disc;

INPUT# X%,A$,B$,A%
  inputs 3 variables
PRINT# X%,A$,B$,A%
  writes 3 variables

A%=BGET#X% and BPUT#X%,A% read and write one byte. With random access files the following approach is needed;

```
Y%=119*n:PTR# X%=Y%:
  INPUT# X%,A$
PTR# X%=Y%+32:INPUT# X%,
  B$
PTR# X%=Y%+114:INPUT# X%,
  A%
```

This is a simple example to cope with our data. A more complex set of read and print data sets is given by listing 1.

This is very similar to the simple example, but uses DATA statements to set the value of PTR#. The initial value of PTR# is set by the procedure parameter. Note also the apparently wasted printing of 0 in line 100. This brings us to how the operating system works, and the final, important Basic command CLOSE#.

Data manipulation is not done directly on disc. Blocks of 256 bytes are transferred into memory, are read or changed and then printed back to the disc. The next 256 bytes are then brought into memory. This produces the greatest speed and efficiency if the data of one variable does not cross this 256 'barrier'. Indeed, sets of data should be kept within these 256 byte blocks (starting at 0), eg 64 or 128, etc, bytes per set of data. Listing 1 needs almost 256 bytes for each set; the final PRINT# X%,0 is to ensure the full 256 bytes are used and that the next set starts in the correct place.

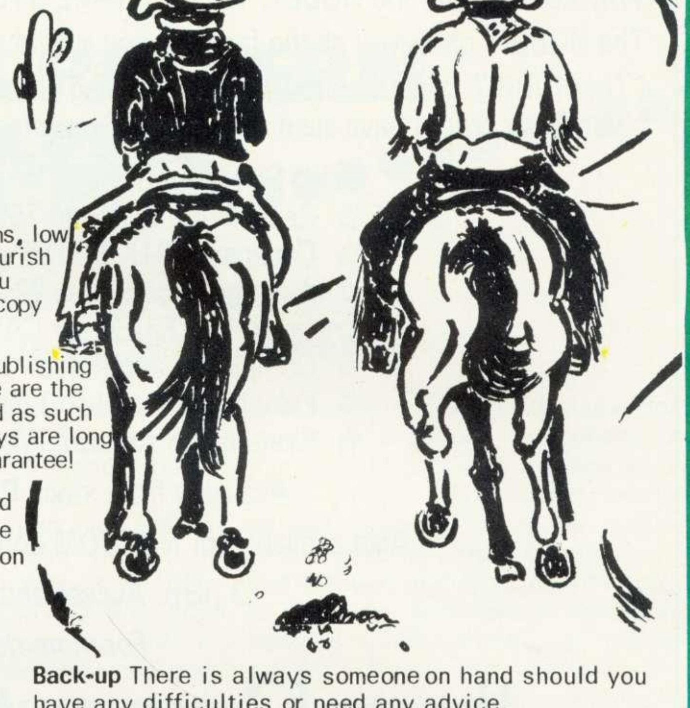
Any changes to these 256 bytes will not be transferred to disc until the next set is read in, which would lead to problems at the end of a program, with 256 bytes left in memory. The command CLOSE# X% closes the file with channel number X%, so no further data transfer can take place: it also ensures the last 256 bytes are correctly put on disc. CLOSE# 0 closes all open files. It is essential to use CLOSE# at the end of a program, and not simply escape or break.

It is perhaps worth mentioning a further advantage of random access files. A pointer can be saved with each set of data, which if loaded into PTR# points to the next related set; thus an alphabetical series (for example) can be obtained quickly without having to enter the sets in order.

A few final points on data storage. First, the operating system contains routines to do all of the above from machine code. However, with programs highly dependant on disc access, the disc transfer rate is usually the limiting speed factor. If very fast sorting from disc is needed, a different approach must be used. *LOAD and *SAVE move data much faster to and from disc and could be used to put a large block of data into memory. This does have problems though, particularly of memory size (again!) and ease of manipulation.

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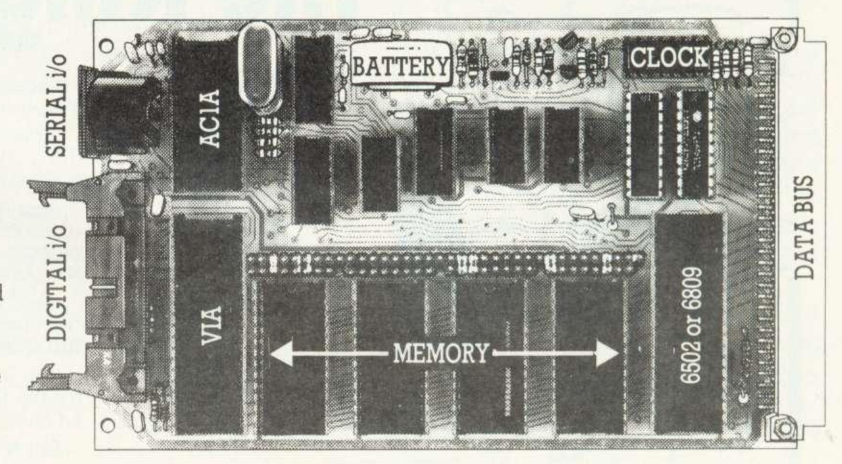
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COLOUR & PATTERN DUMPS

George Hill takes you step-by-step through to producing hard copy of colour screens

In a previous article (*Acorn User*, June) screen dumps of the on/off type were covered. The following conventions used then will be continued here:

- 'byte' will refer to the byte being built up to send to the printer;
- X and Y (and X% and Y%) will refer to screen coordinates;
- x and y (and x% and y%) will refer to small variations in X and Y while building up printer bytes.

The problems of mode 0 dumps and of 'colour', or more accurately 'pattern' dumps, are closely allied. They arise from the number of dots necessary to give full screen coverage.

The X direction in mode 0 has a resolution of 640 pixels per line, while the resolution in the Y direction is only 256 pixels per column. A printer with fewer than 640 dots per line will have to print the picture 'sideways' (figure 1). This might indicate that we can print a full screen dump with only 256 dots per line, but distortion would result because mode 0 pixels are rectangular. To illustrate this, try program 1. The horizontal line is twice as wide as the vertical one. Thus we need two dots per pixel in the Y direction, and one dot in the X direction. This needs a minimum of 512 dots per line from your printer. Seikosha owners cannot obtain a full dump of the mode 0 screen in a single scan. The solution in these circumstances is either to split the screen, and dump it in two halves, or to miss a bit off.

When designing screen dumps it is helpful to draw a diagram of the screen, in the orientation in which it is to be dumped. Its corners are labelled with their coordinates, which makes writing the controlling X and Y loops much simpler. Figure 1 illustrates the two obvious choices of orientation, referred to as plan A and plan B respectively.

Plan A will be scanned by a loop:

```
FOR Y=1023 TO 0 STEP -N
FOR X=0 TO 1279 STEP M
NEXT:NEXT
```

Plan B is scanned by:

```
FOR X=0 to 1279 STEP N
FOR Y=0 TO 1023 STEP M
NEXT:NEXT
```

In mode 0, it is necessary to repeat a dot in the Y direction. This is usually easier to accomplish on the 'dot-band' printer using plan B.

There are inevitably special cases, so general programs are less easy to write. Two typical printer oddities are the Olivetti's ability to print twice as many dots in the vertical direction as in the horizontal, and the Seikosha's seven-dot wide ban. The dumps used to illustrate mode 0 printing are for Olivetti and Centronics 739. (For the latter I am indebted to Iain Cameron from Inverness.)

In program 2, the Olivetti dump, lines 1000 to 1010 set up the printer to dump the whole screen. CONTROL, which is sent to the

Program 2. Mode 0 screen dump for the Olivetti

```
 1ØØØ REM DUMPØ
 1ØØ1 REM to dump the screen in MODEØ o
n the OLIVETTI spark-jet printer.
 1ØØ2 REM CONTROL is the code to define
 the image
 1ØØ3 DIM CONTROL 15
 1ØØ4 $CONTROL=CHR$(27)+"G12Ø;32;8Ø;1"+
CHR$(27)+"Z"
 1ØØ5 REM call printer
 1ØØ6 *FX5,1
 1ØØ7 REM enable printer and clear pape
r
 1ØØ8 VDU2,1,1Ø,1,1Ø
 1ØØ9 REM send CONTROL to printer via V
DU1
 1Ø1Ø FOR I=Ø TO 15:VDU1,CONTROL?I:NEXT
 1Ø11 REM scan screen and send data to
printer
 1Ø12 FOR X%=Ø TO 1279 STEP2
 1Ø13 FOR Y%=Ø TO 1Ø23 STEP 32
 1Ø14 byte=Ø
 1Ø15 FOR y%=Ø TO 31 STEP 4
 1Ø16 byte=byte*2
 1Ø17 IF POINT(X%,Y%+y%)>Ø THEN byte=by
te+1
 1Ø18 NEXT
 1Ø19 VDU1,byte
 1Ø2Ø NEXT
 1Ø21 NEXT
 1Ø22 REM disable printer
 1Ø23 VDU3
 1Ø24 END
```

Program 1. Mode 0 line demonstration

```
 1Ø REM MODE Ø line demo
 2Ø MODEØ
 3Ø MOVE 1ØØ,1ØØ
 4Ø DRAW 1ØØ,9ØØ
 5Ø DRAW 1ØØØ,9ØØ
```

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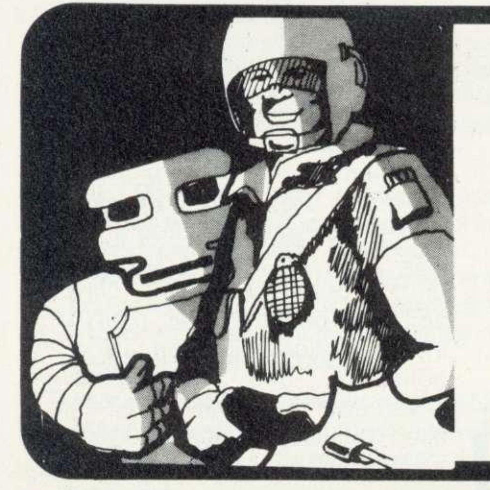
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printer via VDU1 at line 1010, sets the vertical resolution to one (the last figure in inverted commas), and defines the picture to consists of 32*8 dots horizontally (256 double-width dots for the Y axis), and 80*8 dots vertically (the 640 small dots for the X axis). The screen is scanned, building printer bytes in the conventional fashion, in lines 1012 to 1021.

In program 3, the Centronics dump, (presented as a procedure), the printer is set up in lines 1000 to 1050. The escape sequence merely sets the printer into graphics modes. The screen is scanned in lines 1070 to 1180. Notice the adjustment to byte at line 1140, as the Centronics graphics characters start at 32. Line 1150 sends the byte to the printer twice, giving double dots in the Y direction, to account for the rectangular pixels. Line 1170 sends the carriage return to the printer (code 13 is not recognised as a graphics character by this printer).

The 'fiddle' necessary for the Seikosha is present in the 'pattern' dump printed later in this article, and readers should be able to write their own mode 0 dump using the same principle.

Figure 1. Screen orientation

(0,1023) TOP (1279,1023) (0,0) (0,1023)
PLAN A
BOTTOM
PLAN B
TOP
(0,0) BOTTOM (1279,0) (1279,0) (1279,1023)

Figure 2. Epson dot patterns

note gaps — Normal mode
overlapped — Condensed mode
touching — Dot pattern for most other printers

Figure 3. Patterns for mode 1, 4, 5 dumps

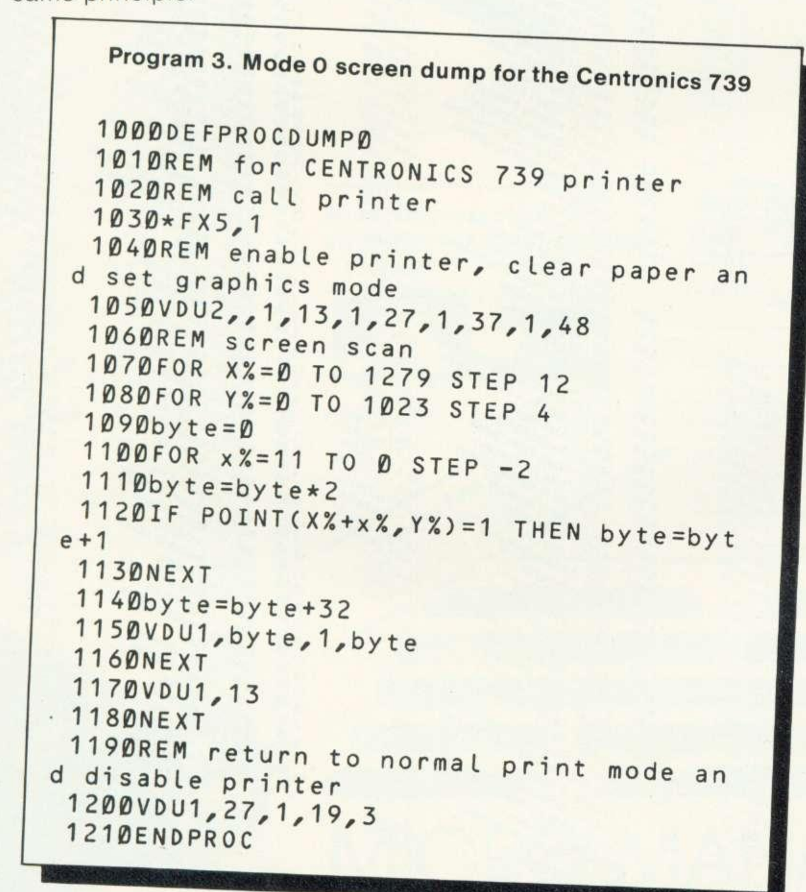
COLOUR 0 1 2 3
any single dot will do
should be two dots NOT used for colour 1

Figure 4. Epson dot patterns for MODES 1, 4 & 5

Colour 0 1 2 3

Figure 5. Preparation of dot patterns

1 3 0 2
PIXELS having the colour shown
For the line-of-dots printer
byte for pass 1
byte for pass 2
1 3 0 2
PIXELS having the COLOURs shown
For the dot-band type of printer
byte 1 byte 2



Program 3. Mode 0 screen dump for the Centronics 739

```
1000DEFPROCDUMP0
1010REM for CENTRONICS 739 printer
1020REM call printer
1030*FX5,1
1040REM enable printer, clear paper an
d set graphics mode
1050VDU2,,1,13,1,27,1,37,1,48
1060REM screen scan
1070FOR X%=0 TO 1279 STEP 12
1080FOR Y%=0 TO 1023 STEP 4
1090byte=0
1100FOR x%=11 TO 0 STEP -2
1110byte=byte*2
1120IF POINT(X%+x%,Y%)=1 THEN byte=byt
e+1
1130NEXT
1140byte=byte+32
1150VDU1,byte,1,byte
1160NEXT
1170VDU1,13
1180NEXT
1190REM return to normal print mode an
d disable printer
1200VDU1,27,1,19,3
1210ENDPROC
```

At this point it is opportune to introduce 'the Epson problem'. Readers with MX80FT – type printers will be wondering why they produce oval circles in simple dumps. The reason is that Epson have used an asymmetrical dot matrix, in which spaces between vertical dots are different from those between horizontal dots. In normal print mode (corresponding to 480 graphics dots per line) the horizontal spaces are bigger than the vertical ones. In condensed mode (960 dots per line) the situation is reversed (figure 2). A satisfactory solution in mode 0 is a

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plan B dump, similar to program 3. The printer is set to condensed graphics, 768 dots per line, and byte is printed three times instead of two. The 'problem' works to our advantage in 'pattern' dumps which follow, as it allows us to use a three by two matrix for patterns, giving more variety than the more normal two by two matrix. The oval circles become round in these dumps.

Simple on/off dumps are less than satisfactory in use with colour graphics, as they cannot distinguish between, say, red and yellow which look very different even on a black and white screen.

Modes 1, 4 and 5 will handle four-colour modes which are returned by the Basic function POINT(X,Y), as the numbers 0,1,2 and 3. (VDU 19 does not affect these values.) For normal pattern dumps (ie non-Epson) we can represent these by the dot patterns in figure 3. There is more freedom on the Epson, typical patterns being shown in figure 4.

Information about a single pixel will be carried in two printer bytes, (three for the Epson), whether in plan A or B. For the 'dot-band' printer, plan A is easier. There will always be a fiddle necessary on any printer which prints an odd number of dots in its band (eg the Seikosha). The principle of preparing dot paterns is illustrated in figure 5.

If lines of dots are printed, it will be necessary to scan each line of pixels twice, printing different selections from the underlying patterns on each 'pass'.

There are two ways to store the patterns. The first, and more familiar to most Basic users, uses arrays. The principles were previously discussed in an article on the Epson dumps published in October's *Acorn User*, but here is a brief recap.

The patterns must be split either vertically (for the dot-band printer) or horizontally (for the line-of-dots printer). The resulting numbers will be called up in two ways:

- by whether they are for byte1 or byte2 (or pass 1 or pass 2) and
- by colour.

They are therefore stored in a two-dimensional array (figure 6). The first parameter tells whether a particular member is for byte1 or byte2, the second tells the colour it represents. Thus for a pixel with colour 2, we would select P(1,2) for byte1, and P(2,2) for byte2. The split patterns are translated into binary numbers, giving values for the array elements shown in figure 7.

For future expansion into assembly language, I recommend everyone to become familiar with 'byte indirection', one of the BBC's best features, derived from its Atom ancestry. First, *both* sections of the pattern for each colour are stored in a single byte (figure 8).

We can access the first element by obtaining 9 DIV 4 = 2 decimal = 10 binary, and the second by obtaining 9 MOD 4 = 1 decimal = 01 binary.

The patterns are stored by first

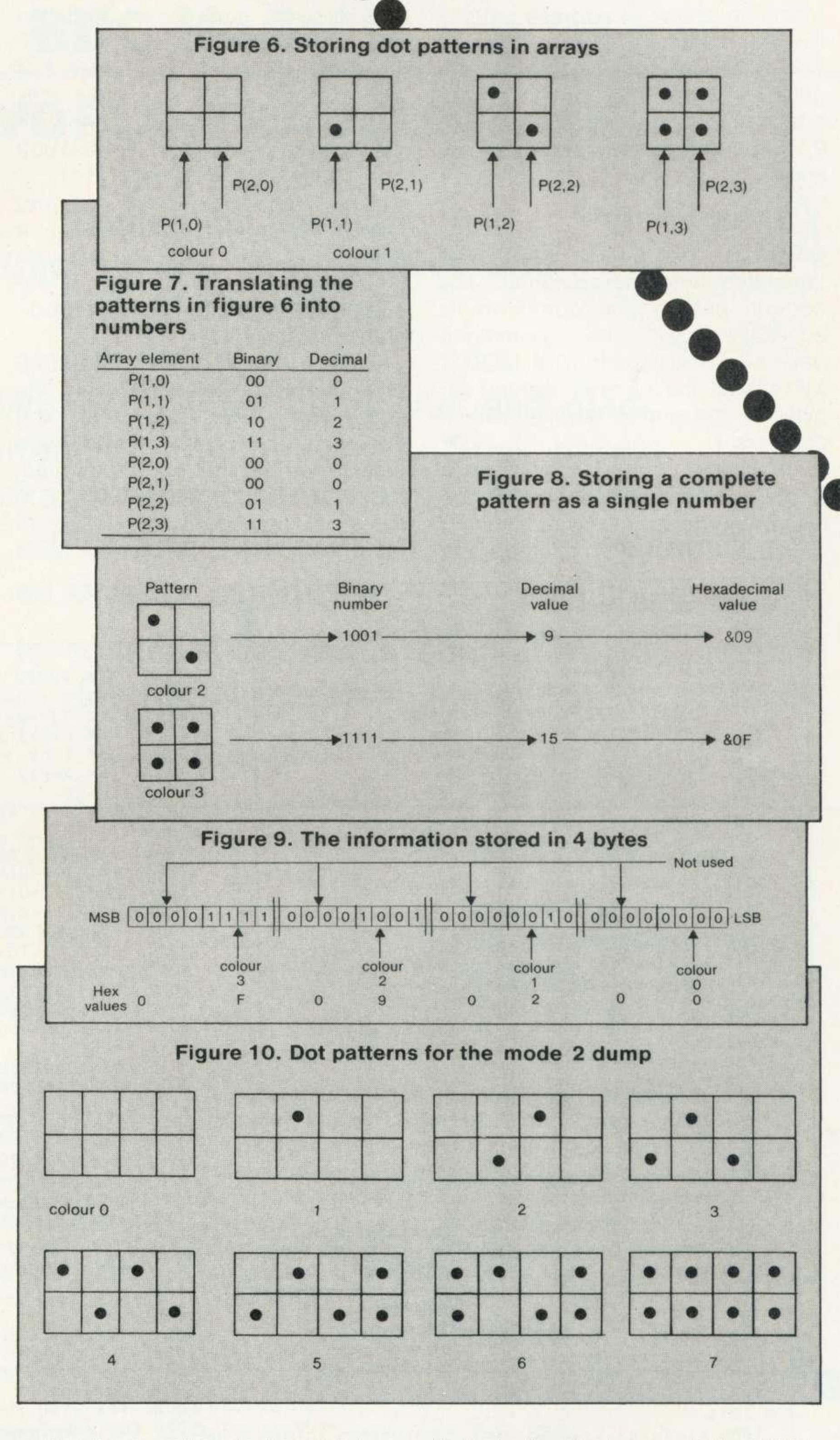

Figure 6. Storing dot patterns in arrays

Figure 7. Translating the patterns in figure 6 into numbers

Array element	Binary	Decimal
P(1,0)	00	0
P(1,1)	01	1
P(1,2)	10	2
P(1,3)	11	3
P(2,0)	00	0
P(2,1)	00	0
P(2,2)	01	1
P(2,3)	11	3

Figure 8. Storing a complete pattern as a single number

Figure 9. The information stored in 4 bytes

Figure 10. Dot patterns for the mode 2 dump



reserving space at address pattern, by the statement DIM pattern 3. This reserves four bytes for our patterns, which will contain the 32 bits of information shown in figure 9. This information is stored by the line

!pattern=&0F090200

which is the binary information translated into hexadecimal. The correct pattern for colour n is accessed by the command pattern?n. Thus (pattern?3) MOD 4 will extract the number wanted for byte1, representing a pixel whose colour is 3.

In simple dumps involving a single dot per pixel, we 'rotate' the byte one bit at a time by multiplying by 2, but in pattern dumps the printer bytes must be rotated two bits at a time, so we multiply by 4. The Seikosha dump for modes 1, 4 and 5 (program 4) uses this approach. It is a plan B dump with the patterns stored in lines 1002 and 1003.

Line 1006 defines the top and bottom coordinates, chopping a little off each, to allow the 480 dot line length to cover most of the screen in a single scan. Line 1007 starts the scan.

Lines 1008, and 1019 and 1020 are necessary to cope with the seven-dot wide band of the Seikosha. Four pixels are read each time. When the first band is printed, the bottom dot (corresponding to the most significant byte (MSB) of the printer byte) is lost, as the MSB must be set to 1 (line 1020). When the second band is prepared, the pixel with the lost dot is read again, but this time the other dot is removed (line 1019), before setting the MSB to 1. Thus at line 1012, x% steps alternately from 15 to 3 and from 27 to 15, reading the '15' pixel twice. Lines 1016 and 1017 prepare the bytes as indicated, and line 1021 prints them.

All simple dumps are unsatisfactory in mode 2 as the range of colours is too great for anything but a pattern dump. We need to be able to represent *at least* eight colours, and 16 would be necessary if all the flashing colours needed separate patterns. Fortunately, the flashing colours normally flash against a background of a

page 89 ▶

```
 1ØØØ REM DUMP1
 1ØØ1 REM MODE145 dump for SEIKOSHA AP-
1ØØA
 1ØØ2 DIM pattern 3
 1ØØ3 !pattern=&ØFØ9Ø8ØØ
 1ØØ4 REM enable printer,clear paper &
turn on graphics mode
 1ØØ5 VDU2,1,1Ø,1,1Ø,1,1Ø,1,8
 1ØØ6 bottom=82:top=bottom+959
 1ØØ7 FOR X%=Ø TO 1279 STEP 28
 1ØØ8 FOR split%=Ø TO 1
 1ØØ9 left=12*split%:right=left+15
 1Ø1Ø FOR Y%=bottom TO top STEP 4
 1Ø11 byte1=Ø:byte2=Ø
 1Ø12 FOR x%=right TO left STEP -4
 1Ø13 colour=POINT(X%+x%,Y%)
 1Ø14 IF colour<Ø THEN colour=Ø
 1Ø15 byte1=byte1*4:byte2=byte2*4
 1Ø16 byte1=byte1+pattern?colour MOD 4
 1Ø17 byte2=byte2+pattern?colour DIV 4
 1Ø18 NEXT
 1Ø19 IF split%=1 THEN byte1=byte1 DIV
2:byte2=byte2 DIV 2
 1Ø2Ø byte1=byte1 OR
  128:byte2=byte2 OR
 1Ø21 VDU1,byte1,1,byte2
 1Ø22 NEXT
 1Ø23 NEXT
 1Ø24 NEXT
 1Ø25 REM cancel graphics mode and disa
ble printer
 1Ø26 VDU1,15,3
 1Ø27 END
```

Program 4. Seikosha dump for modes 1, 4 and 5

```
 1000 REM DUMP2
 1001 REM 8 tone picture dump for use
with OLIVETTI spark-jet printer
 1002 REM pass% used as counter for 2
passes per line
 1003 REM Array P%(n,m) used to store
bit patterns
 1004 REM n is the pass and m is the c
olour
 1005 DIM P%(2,8)
 1006 P%(1,0)=0:P%(2,0)=0
 1007 P%(1,1)=0:P%(2,1)=4
 1008 P%(1,2)=2:P%(2,2)=4
 1009 P%(1,3)=4:P%(2,3)=10
 1010 P%(1,4)=10:P%(2,4)=5
 1011 P%(1,5)=5:P%(2,5)=11
 1012 P%(1,6)=13:P%(2,6)=11
 1013 P%(1,7)=15:P%(2,7)=15
 1014 REM CONTROL is the code to defin
e the image
 1015 DIM CONTROL 15
 1016 $CONTROL=CHR$(27)+"G120;80;64;2"
+CHR$(27)+"Z"
 1017 REM call printer
 1018 *FX5,1
 1019 REM enable printer and clear pap
er
 1020 VDU2,1,10,1,10
 1021 REM send CONTROL to printer via
VDU1
 1022 FOR I=0 TO 14:VDU1,CONTROL?I:NEX
T
 1023 REM scan screen and send data to
printer
 1024 FOR Y%=1023 TO 0 STEP -4
 1025 FOR pass%=1 TO 2
 1026 FOR X%=0 TO 1279 STEP 16
 1027 byte=0
 1028 FOR x%=0 TO 15 STEP 8
 1029 byte=byte*16
 1030 colour=POINT(X%+x%,Y%) MOD 8
 1031 byte=byte+P%(pass%,colour)
 1032 NEXT
 1033 VDU1,byte
 1034 NEXT
 1035 NEXT
 1036 NEXT
 1037 REM send formfeed to clear paper
 1038 VDU1,12
 1039 REM disable printer
 1040 VDU3
 1041 END
```

Program 5. Eight tone picture dump for the Olivetti in mode 2

```
 1ØØØ DEFPROCDUMPIT
 1ØØ1 DIM value 4
 1ØØ2 A%=&87
 1ØØ3 !value=USR(&FFF4)
 1ØØ4 mode=value?2
 1ØØ5 IF mode=3 OR mode=6 OR mode=7 THE
N 1Ø14
 1ØØ6 maxX=FNmax(mode)
 1ØØ7 col=128+POINT(1279,Ø)
 1ØØ8 VDU4
 1ØØ9 VDU28,maxX,31,maxX,31
 1Ø1Ø COLOURcol:CLS
 1Ø11 PAGE=TOP+&1ØØ
 1Ø12 IF mode=2 THEN CHAIN"DUMP2"
 1Ø13 IF mode=Ø THEN CHAIN"DUMPØ" ELSE
CHAIN"DUMP145"
 1Ø14 CLS
 1Ø15 PRINTTAB(Ø,15);"Not a graphics MO
DE"
 1Ø16 ENDPROC
 1Ø17 DEFFNmax(M)=1Ø*2^(3-M MOD 3)-1
```

Program 6. Procedure to run a dump automatically

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<>	not equal
<	less than
>	greater than
<=	less than or equal
>=	greater than or equal

However, Atom Basic is different. Whilst strings can be tested for equality, you cannot directly carry out other relational tests. So,

IF $A = $B THEN ... is fine.
IF $A < $B THEN ... is invalid

Let's imagine, you wish to sort a series of strings into alphabetical order. On the face of it, such a process may cause Atom users some concern. How do you sort strings if you apparently can't test which is greater, or less than, the others?

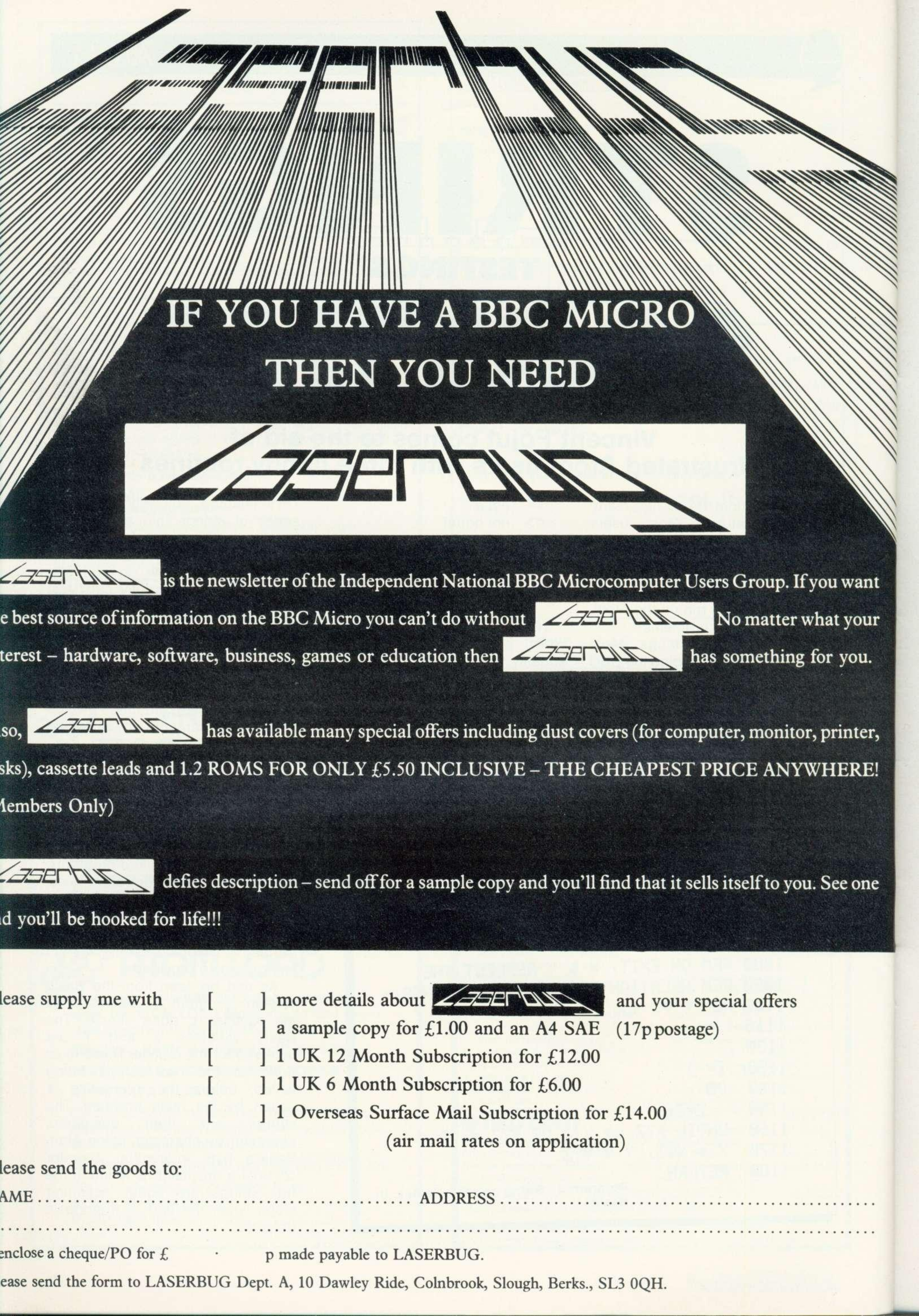
Take heart! There are several ways of tackling such problems, each with their own merits. In this case, what we need, ideally, is a general-purpose routine which allows us to carry out *any* relational test on *any* two strings.

A couple of subroutines which match our requirements, are provided here. Though functionally identical, one is in Basic, the other in machine code (to suite all tastes). Whilst the Basic version is possibly easier to incorporate into programs, the machine code equivalent does, as one might expect, offer speed advantages. To demonstrate the subroutines in action, a useful program for sorting variable-length strings is also provided.

As can be seen from the Basic version, program 1, operation of the routine is quite simple. The Basic variables X and Y are reserved for the routine. These must point to the two strings being tested, before the subroutine is called by the main program. The strings are then compared, character by character, using Atom Basic's byte indirection operator '?', until a mismatch is found. If the two strings are equal, scanning stops when the end of a string is detected.

```
1000 REM ATOM BASIC STRING
1010 REM RELATION TESTER.
1020 REM USES VARIABLES X,Y & Z.
1030 ;
1040 REM ON ENTRY, X & Y POINT
1050 REM TO THE TWO STRINGS TO BE
1060 REM COMPARED.
1070 ;
1080 REM ON EXIT, X & Y REFLECT THE
1090 REM RELATION BETWEEN THE STRINGS:-
1100 REM ( =, <>, <, >, <=, >= )
1110 ;
1120 ;
1130r Z=-1
1140  DO
1150    Z=Z+1
1160  UNTIL X?Z <> Y?Z OR X?Z = #D
1170  X = X?Z; Y = Y?Z
1180  RETURN
```

Program 1. String relation tester, in Basic


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Once a mismatch or end of string is encountered, the two variables, X and Y, are set up to reflect the relation between the strings. For example, if the first string is less than the other, X will be less than Y on exit. This relation can then be tested in Basic, using IF or UNTIL statements.

For instance, the following will test if $A is less than $B:

X=A; Y=B (set up X and Y to point to the two strings)
GOSUB r (call the 'relation test' subroutine)
IF X<Y . . . (ie IF $A<$B . . .)

Similarly, using the machine code version (assuming a start address of R), to test if $AA(1) is greater than or equal to $AA(2):

X=AA(1); Y=AA(2) (set up pointers)
LINK R (call machine code subr.)
IF X>=Y . . . (ie IF $AA(1) >= $AA(2) . . .)

In this relatively simple way, a comparative test can be performed on any two strings.

The machine-code version of the routine (program 2) follows the same fundamental algorithm as its Basic counterpart. It is used in exactly the same fashion – ie X and Y point to the pair of strings to be examined, before the code is called via the LINK command. On return, X and Y will, as before, reflect the relative status of the strings.

Once program 2 has been run, the code generated can be saved as a separate machine-code file. Since it occupies a mere 44 bytes in this form, loading time should be trivial, thus encouraging use of the routine.

There is a particular advantage in using the variables X and Y with an assembly-language program, since the LINK command automatically passes the low-byte values of the Basic variables A, X and Y into the A, X and Y registers of the 6502 processor. Consequently, once the machine code version has saved the X and Y register contents in zero-page, it need only pick up the second-order bytes from X and Y to set up pointers to the strings being compared. Note that the routine requires four zero-page bytes for use as string pointers – any four locations in the range #80 to #AF can be used.

```
100 REM ENHANCED STRING HANDLER
110 REM FOR THE ACORN ATOM.
120 REM ALLOWS FULL SET OF RELATIONAL
130 REM OPERATIONS TO BE PERFORMED
140 REM ON STRINGS IN ATOM BASIC.
150 ;
160 DIM LL(3),L(1)
170 FOR N=0 TO 3; LL(N)=-1; NEXT
180 F=#80;  REM POINTER FOR 1ST STRING
190 S=#82;  REM POINTER FOR 2ND STRING
200 X=#339; REM LEAST SIGNIFICANT BYTE
210         REM OF BASIC VARIABLE "X"
220 Y=#33A; REM LEAST SIGNIFICANT BYTE
230         REM OF BASIC VARIABLE "Y"
240 INPUT"ASSEMBLE FROM (#)" H
250 INPUT"LIST ASSEMBLY (Y/N)"$L
260 IF $L="N" P.$21
270 FOR N=1 TO 2; P=H
280 ;
290 REM ON ENTRY, THE X & Y REGISTERS
300 REM HOLD THE LO-BYTE VALUES OF
310 REM THE TWO STRING POINTERS
320 REM (PASSED VIA THE 'LINK' COMMAND)
330[
340:LL0
350   STX F      \set up string ptr. 1
360   LDA X+27   \(2nd byte of BASIC
370   STA F+1    \  variable "X")
380   STY S      \set up string ptr. 2
390   LDA Y+27   \(2nd byte of BASIC
400   STA S+1    \  variable "Y")
410   LDY @#FF   \Y=-1 for pre-increment
420:LL1
430   INY        \get next chars
440   LDA (F),Y  \  in strings
450   CMP (S),Y  \  and compare.
460   BNE LL2    \if unequal, exit.
470   CMP @#0D   \check if end of string
480   BNE LL1    \continue if not.
490:LL2
500   STA X      \set up 'X' & 'Y'
510   LDA (S),Y  \  to reflect result
520   STA Y      \  of test.
530   LDA @0     \zeroise 2nd bytes
540   STA X+27   \  of 'X'
550   STA Y+27   \  &  'Y'.
560   RTS
570]
580 NEXT
590 P.$6
600 END
```

Program 2. Machine code version of program 1

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To put the routines into perspective, program 3 gives an alphanumeric bubble sort which accepts a series of variable – length strings, sorts them into alphabetical order using either of the routines described, and prints the results. It can easily be adapted to suit individual requirements.

There are a great many different sorting techniques available to the programmer. Although not the fastest, this bubble sort is relatively easy to code and understand (*Acorn User*, June).

The sort program assumes the machine code version fo the string relation tester is being used, assembled with a starting address of #2800. If the Basic subroutine is used, simply change the 'LINK R' on line 390 to 'GOSUB r', where 'r' is a label on the first line of the Basic subroutine. Try both versions and compare their relative speed performance.

A point to note is that the sort algorithm does not change the physical position of the strings, but re-arranges pointers to them. This is a lot quicker, though the end result is effectively the same.

It should also be mentioned that REMs, indentation and the like, have been used purely for clarity. These should be removed if the sort is to operate as speedily as possible, especially REMs within FOR ... NEXT loops. Basic abbreviations and multi-statement lines will also help. The latter is particularly relevant to the Basic version of the string relation subrouting – it can, in fact, be set in one line.

Clearly, sorting string data is a common requirement, and is a prime example of the need to test strings for more than just 'equality'. The routines outlined above cure this shortcoming in Atom Basic, and provide general-purpose easy to use, and speedy techniques to meet such requirements.

I hope I have shown that you don't necessarily need to put up with any niggling deficiencies in your chosen machine. If your micro lacks a certain feature (and no computer is perfect), improvements can be made using relatively simple techniques, given a little effort and imagination.

```
100 REM STRING SORT PROGRAM FOR THE
110 REM ACORN ATOM. DEMONSTRATES
120 REM STRING RELATION TEST ROUTINE.
130 ;
140 R=#2800;  REM RELATION TEST PROC.
150 INPUT"HOW MANY STRINGS TO SORT"S
160 S=S-1; IF S<0 END
170 ;
180 REM ARRAY AA WILL HOLD POINTERS
190 REM TO THE VARIABLE-LENGTH
200 REM STRINGS ENTERED
210 ;
220 DIM AA(S), T(-1)
230 @=1
240 FOR N=0 TO S
250  PRINT '"STRING " N+1
260  INPUT $T
270  AA(N)=T
280  T=T+LEN(T)+1
290 NEXT N
300 ;
310 REM IF 1 STRING, NO NEED TO SORT
320 IF S=0 GOTO p
330 ;
340 REM (ALPHANUMERIC) BUBBLE SORT
350 FOR N=1 TO S
360  FOR B=S TO N STEP -1
370   REM PERFORM RELATIONAL TEST
380   REM ON TWO "ADJACENT" STRINGS
390   X=AA(B);Y=AA(B-1);LINK R
400   REM SWAP STRINGS IF LOWEST
410   REM VALUE NOT "UPPERMOST"
420   IF X<Y;T=AA(B);AA(B)=AA(B-1);
       AA(B-1)=T
430  NEXT B
440 NEXT N
450 ;
460 REM OUTPUT THE SORTED STRINGS
470 ;
480 PRINT $14
490pPRINT'"STRINGS IN SORTED ORDER"''
500 FOR N=0 TO S
510  PRINT N+1," ",$AA(N)'
520 NEXT N
530 PRINT $15
540 END
```

Program 3. Variable-length string sort

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September Ceefax telesoftware, Beeb in business, mailing list, simple files, 30-Hour Basic course, art on a micro, music, BBC micro as a keyboard, extra Atom commands, BBC Basic board, ULA design, teletext graphics, machine code graphics, analogue input, schools training, 0.1 cassette bug patch.



October Electron details, BBC TV series – confessions, two Epson graphics dumps, Seikosha GP100 dump, World-wide networking for BBC micro, garbage handling, voice ROMs, sound pitch envelope, moving graphics, ZX printer for Atom, RGB colour separations for Atom, biofeedback, book reviews.



November Teletext, second BBC TV series, machine code series 1, programming forum, Trek III, speeding up graphics, Bomber game listing, 7-tone Epson graphics dump, Atom graphics manipulation, dumb terminal for 0.1 machine, firework graphics, editing tips.




December BBC TV in schools, machine code 2 – registers, programming forum, program generators, carols, hints and tips, Logo and turtle graphics in schools, introduction to procedures, software review, Atom word processing, toolbox review, 16-colour graphics on model A, sorting, sound envelope design.



January MEP school launch, *FX commands for sound, second BBC TV series, machine code 3 – two pass assembly, disc drives for the Beeb, programming forum, program protection, micros in schools – new series, Commodore Pet printer used with Beeb, BBC programs written on an Atom, extra Atom memory.

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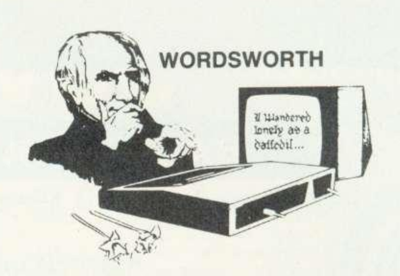
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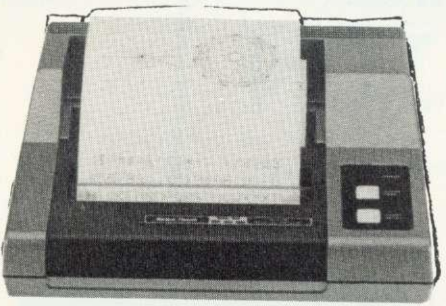
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The printer arrives well packaged with paper, spare pens and power pack, together with a simple but well presented manual. The printer's size, or rather lack of it, belies its potential, and the narrowness of the paper became only a minor disadvantage when I worked out how many times I would really need greater width.

And so on to using this Oriental masterpiece. The printer, unlike others in this price bracket, is not dot-matrix, but is more akin to an X-Y plotter. The print head consists of a rotating mechanism containing four ballpoint pens (black, blue, red and green), each software selectable. The printer contains routines for drawing, rather than printing, the full ASCII character set with upper and lower case (with true descenders), and Japanese script!

The ASCII/Japanese output is selected by a DIP switch along with serial/parallel input, line feed on/off and character size, (40 or 80 characters per line). The latter is also software selectable. The parallel interface is a standard Centronics.

Switching on shows some of the thought that has gone into the design of the software. The pens are vibrated into life and then each in turn draws a small box to get the ink flowing and warn the operator if a pen is low on ink. Changing the pen is a few seconds work and poses no problems. A self-test routine is invoked if the paper feed switch is pressed when the printer is turned on, and results in the full character set being drawn using all four pens.

The printer has two modes of operation, text and graphics, and at switch-on the text mode is selected with the character size determined by the DIP switch.

In text mode, five ASCII codes are used to control backspace, reverse line feed, change colour and select graphics or text mode, and in this mode high quality text may be produced, albeit rather slowly at 12cps (program 1).

```
 10 REM LISTING ONE
 20 @=0
 30 REM TURN ON PRINTER
 40 P.$2
 50 REM FOR EACH COLOUR
 60 F.C=0 TO 3
 70 REM SELECT GRAPHICS MODE
 80 P.$18
 90 REM SELECT COLOUR
100 P."C"C'
110 REM GO BACK TO TEXT MODE
120 P."A"
130 REM PRINT TEXT
140 P."COLOUR "C'
150 REM CONTINUE LOOP
160 N.
170 REM SWITCH OFF PRINTER
180 P.$3
190 REM END OF PROGRAM
200 E.
```

Program 1. Text printing

```
COLOUR 0
COLOUR 1
COLOUR 2
COLOUR 3
```

Same size example

```
 10 REM LISTING TWO .
 20 P.$2'$18'"S1"'"A"'
 30 P."3x + 2y = 45"
 40 S=1;REM SET FLAG
 50 GOS.190
 60 P."    3          2"
 70 GOS.230
 80 P.''"C H OH"
 90 S=0;REM CLEAR FLAG
100 GOS.190
110 P."  2   5"
120 GOS.230
130 P.$3;E.
140 REM - SUBROUTINE 1 -
150 REM SETS PRINTER TO PRINT
160 REM SUPER- OR SUBSCRIPT
170 REM DEPENDING ON STATE OF
180 REM FLAG 'S'
190 P.'$18"S0"'"A"'
200 F.L=1TO(3+S);P.$11;N.;R.
210 REM - SUBROUTINE 2 -
220 REM RESTORES ORIGINAL MODE
230 P.'$18"S1"'"A"';R.
```

Program 2. Equations

$3x^3 + 2y^2 = 45$

C_2H_5OH

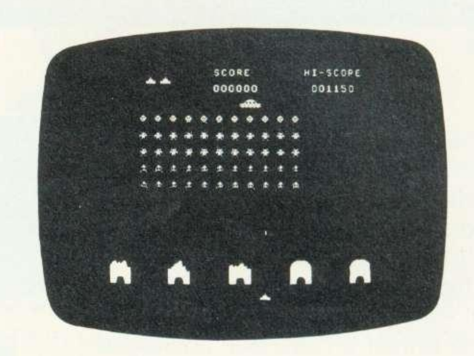
Same size example

However, it is in the graphics mode that this printer really scores. As previously mentioned, it behaves as an X-Y plotter with the pen having a horizontal resolution of 480 steps, each 0.2mm. The vertical direction has the same resolution but without limit, and the accuracy of the paper feed is maintained by a tractor feed using small pins on the paper roller.

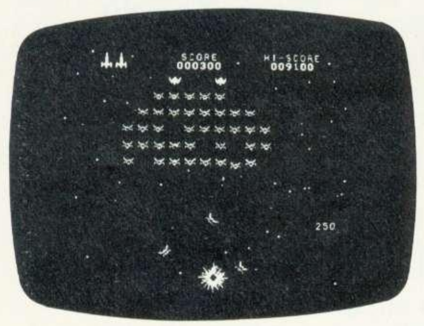
Once in the graphics mode, the printer is controlled by passing to it any of 13 control codes, (all alphabetic), together with any other information required. Program 1, for example, will give one line of output for each pen, the colour being selected by outputting a 'C' followed by the variable containing the required colour code, (0-3). Note also the use of ' to force a carriage return which is required for some codes.

Controlling the print size is more complicated because the size, in characters per line, is passed using

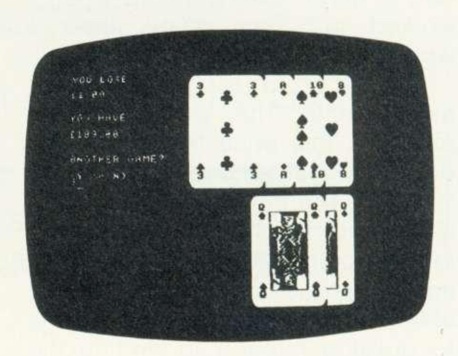




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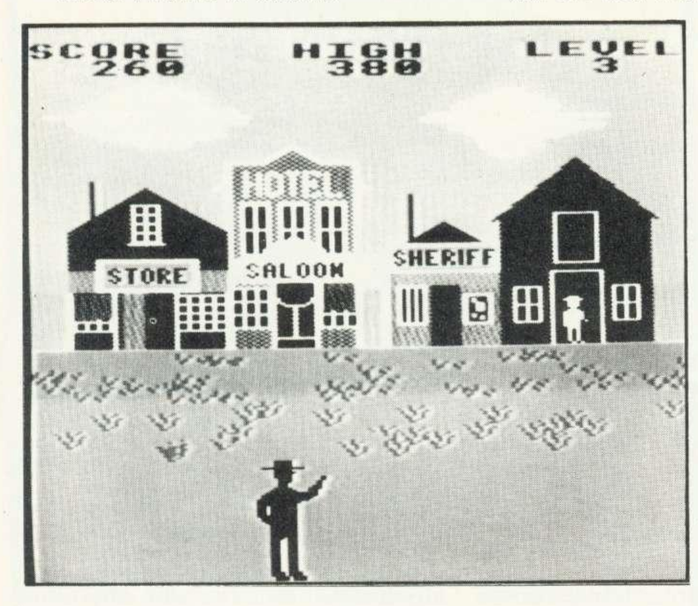




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AND NOW

GUNSMOKE

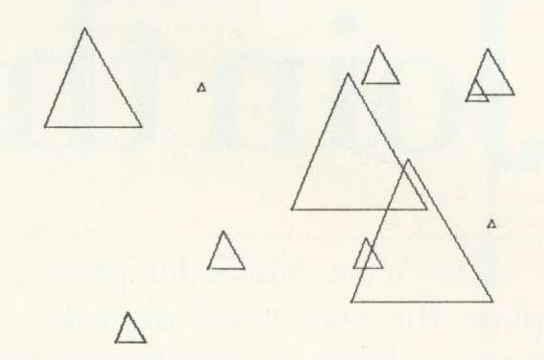
005 GUNSMOKE is the latest release from SOFTWARE INVASION. It's completely different from any game you've played before. Superb realistic sound effects - high speed animation - nail biting action - fantastic highly detailed graphics, mixing colours to produce brown, grey and olive in addition to the normal shades. You play the part of a Wild West Gunslinger, dodging bullets and trying to to shoot bandits as they appear in doors, windows, alleys and on the roof. There's sixteen different bandits who need no provocation to fill you full of lead. If you manage to kill them all, it's not over, day turns to night and the nightmare begins again.

If you're quick on the draw, this game's for you!
GUNSMOKE runs on a BBC Micro model B and costs just £7.95 inclusive.

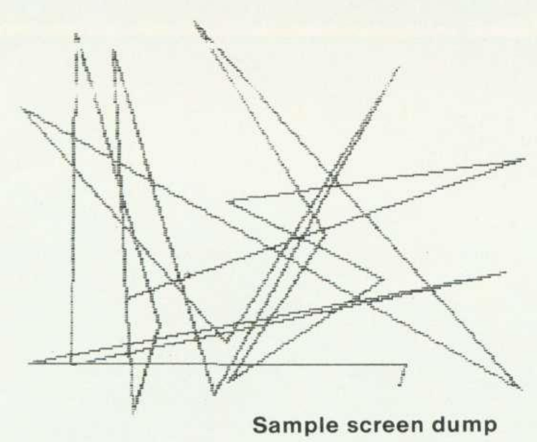
50 Elborough St., Southfields, London SW18 5DN.

```
 10 REM LISTING THREE
 20 REM SELECT GRAPHICS MODE
 30 P.$2$18'
 40 REM 12 TRIANGLES REQUIRED
 50 F.L=1TO12
 60 REM SELECT RANDOM POSITION
 70 X=A.R.%300;Y=-A.R.%300
 80 REM USE ABSOLUTE MOVE
 90 P."M"X","Y'
100 REM SELECT RANDOM SIZE
110 S=A.R.%20
120 REM DRAW TRIANGLE
130 P."J"5*S","0","-3*S","5*S","-2*S",
"-5*S'
140 REM DRAW REST THEN END
150 N.;E.
```

Program 3. Random triangles



Sample triangles



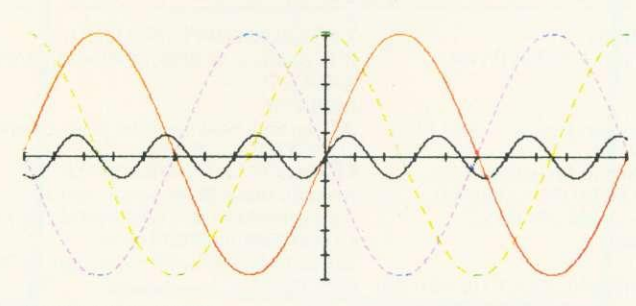
Sample screen dump

```
  10 REM LISTING FOUR
  20 REM SET UP BIT STRING
  30 DIM V7
  40 !V=#10204080;V!4=#1020408
  50 REM DEMO PROGRAM
  60 CLEAR 4
  70 MOVE 0,0;DRAW 255,0
  80 DRAW 255,0;DRAW 255,191
  90 DRAW 0,191;DRAW 0,0
 100 MOVE (A.R.%256),(A.R.%192)
 110 F.L=1TO20
 120 DRAW (A.R.%256),(A.R.%192)
 130 N.
 140 P.$21
 150 GOS.9000
 160 P.$6$7$12;E.
9000 REM SCREEN TRANSFER SUBROUTINE
9010 P.$2$18"M0,-400"'"I"'
9020 F.Y=191TO0 S.-1
9030 F.Z=1TO7;?#B002=?#B002:4;N.
9040 X=0
9050 GOS.a
9060 IF Q G.d
9070gX=X+1;IF X<256 G.9050
9080 N.;P.$3;R.
9090dP."M"%(X*1.8)","%(Y*1.8)'
9100fX=X+1;IF X=256 G.e
9110 GOS.a
9120 IF Q G.f
9130eP."D"%(X*1.8)","%(Y*1.8)'
9140 G.g
9150aP=X/8+(191-Y)*32+#8000
9160 Q=(?P&(V?(X&7))<>0)
9170 R.
```

Program 4. Screen dump

```
 10 REM LISTING FIVE
 20 DIM A1
 30 P.$2$18"R0,-150,240,0"'
 40 P."I"'
 50 P."X1,-20,10"'
 60 P."HX1,20,10"'
 70 P."HX0,16,5"'
 80 P."HX0,-16,5"'
 90 P."C0"'"L0"'
100 B=30;H=15;C=0;GOS.200
110 P."C1"'"L3"'
120 B=-100;H=80;C=0;GOS.200
130 P."C2"'"L5"'
140 B=100;H=80;C=1;GOS.200
150 P."C3"'"L0"'
160 B=100;H=80;C=0;GOS.200
170 P."M0,-150"'"C0"'"A"'
180 P."DONE"''
190 P.$3;E.
200 $A="M"
210 F.I=-200TO200 S.4
220 %S=I/B*PI
230 IF C=0;Y=%(SIN(%S)*H)
240 IF C=1;Y=%(COS(%S)*H)
250 P.$A I","Y';$A="D"
260 N.;R.
```

Program 5. Graphs



Same size graph

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The Acorn Spark-Jet printer employs the very latest dry-ink printing technology, resulting in fast, clean and virtually noiseless printing.

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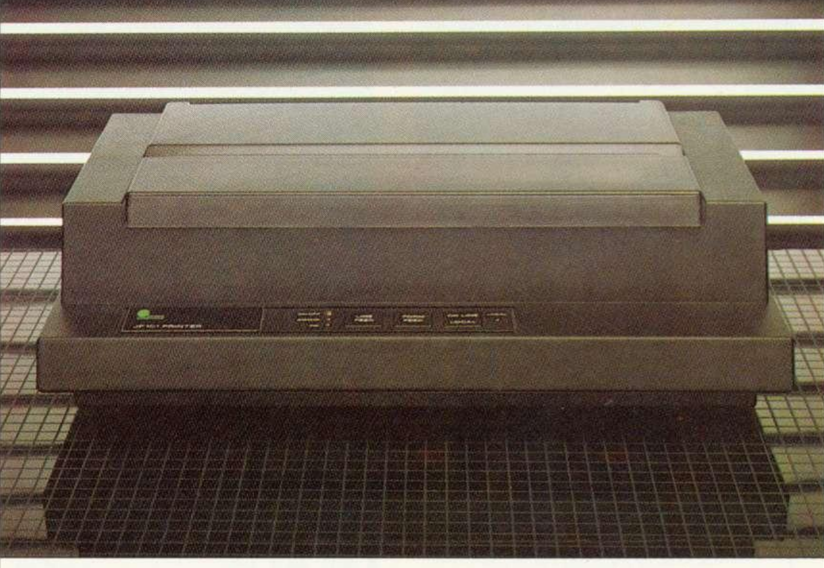
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THE ACORN SPARK-JET PRINTER

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227 Dartmouth Road, Sydenham, London SE26 4QY.
01-699 6202/4399.

AU 8



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```
10 REM LISTER
20 REM
30 REM UTILITY LISTING PROGRAM
40 REM
50 REM AMENDED 13/4/83
60 S=#2900;P=S;C=0;@=5;N=0;F=0;Q=0
70 DIM K20,D8,T255;REM STRINGS

80 REM GET PROGRAM NAME
90 P.$12;IN."PROGRAM TITLE "$K
100 IF $K="" G.130
110 IN."ENTER DATE "$D

120 REM TURN OFF SCREEN
130 P.$21

140 REM TURN ON PRINTER
150 P.$2

160 REM PRINT HEADER IF PRESENT
170 IF $K="" G.240
180 GOS.e
190 P.$K
200 P.'$18'"C0"'"A"'$11$11$11'
210 F.L=1 TO LENK;P." ";N.
220 P." ON "$D''

230 REM MAIN PROGRAM
240 P=P+1

250 REM CHECK FOR END
260 IF ?P=#FF G.z

270 REM PRINT LINE NO.
280 L=?P*256+P?1;P=P+2;C=0;I=0

290 REM SELECT BLACK PEN
300 P.$18'"C0"'"A"

310 REM CLEAR FLAG
320 F=0

330 REM CHECK FOR QUOTES
340 IF C?P=34;DO C=C+1;U.C?P=34

350 REM REMOVE LEADING SPACES
360 DO IF ?P=32 P=P+1
370 U.?P<>32

380 REM GET LABEL,IF PRESENT
390 IF ?P>96 AND ?P<123 Q=?P;P=P+1

400 REM CHECK FOR REM OR '\'
410 $K="REM";IF C?P=?K;GOS.c;IF F GOS.
e;C=LENP;G.560
420 IF ?P=92 GOS.e;C=LENP;G.1090

430 REM CHECK INDENT WORDS
440 GOS.a
450 IF F G.490

460 REM CHECK UNINDENT WORDS
470 GOS.b

480 REM CHECK FOR END OF LINE
490 IFC?P=#0D U=0;G.560

500 REM CHECK FOR EMBEDDED REM
510 $K+1="REM";?K=59
520 GOS.d;IF F R=1;G.560
530 IF C?P=92;R=1;G.560
540 IF F=0 C=C+1
550 G.320

560 REM PRINT LINE NUMBER
570 P.L

580 REM PRINT LABEL OR SPACE
590 IF Q>0 P.$Q;Q=0;G.620
600 P." "
610 REM PRINT INDENT
620 IF N=0 OR N=I G.670
630 F.Z=1TO N-I
640    P."  "
650 N.

660 REM PRINT LINE
670 $T=$P;$T+C=""
680 P.$T
690 P=P+C
700 IF R=0 P.';G.240

710 REM PRINT EMBEDDED REM
720 GOS.e;IF U=1 P.$11
730 F.L=-5TOLENT+(N*2)
740    P." "
750 N.
760 P.$P
770 R=0;U=0
780 P=P+LENP
790 P.'
800 G.240

810 REM END OF PROGRAM
820zP.'$18'"C0"'"A"'
830 P.''"PROGRAM SIZE ="TOP-#2900" BYT
ES"'
840 P."FREE SPACE    ="#3900-TOP" BYTES
"''

850 REM TURN OFF PRINTER
860 P.$3

870 REM TURN ON SCREEN
880 P.$6

890 REM RETURN TO SOURCE TEXT AREA
900 ?18=#29
910 E.

920 REM    SUBROUTINES
930 REM    ===========
940 REM
950 REM
960 REM SUBROUTINE TO CHECK FOR INDENT
ING KEYWORDS
970a$K="DO";IF C?P=?K;GOS.c;IF F;G.101
0
980 $K="FOR";IF C?P=?K;GOS.c;IF F;G.10
10
990 $K="F.";IF C?P=?K;GOS.c;IF F G.101
0
1000 R.
1010 N=N+1;I=1;G.1090

1020 REM SUBROUTINE TO CHECK FOR UNINDE
NTING KEYWORDS
1030b$K="N.";IF C?P=?K;GOS.c;IF F;G.108
0
1040 $K="NEXT";IF C?P=?K;GOS.c;IF F;G.1
080
1050 $K="U.";IF C?P=?K;GOS.c;IF F G.108
0
1060 $K="UNTIL";IF C?P=?K;GOS.c;IF F G.
1080
1070 R.
1080 N=N-1;REM DECREASE INDENT
1090 C=C+LENK-2;R.

1100 REM SUB.TO CHECK FOR $K
1110cX=(C-1)?P;IF X<>32 AND X<>59 AND X
<91 AND X>59 AND C>0 F=0;R.
1120dF=1
1130 F.Z=0TO LENK-1
1140    IF Z?K<>(C+Z)?P F=0
1150 N.
1160 R.

1170 REM SUB. TO CHANGE PEN COLOUR"
1180eP.'$18'"C3"'"A"
1190 IF U P.$11
1200 U=U+1;R.
```

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Program 6. New listing aid

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WELLINGTON
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082 347 7117

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a formula that results in a rather limited size of characters for the range of the variable that may be passed (0-63). For example, if this variable is set from 0-3, the character size that results is 80, 40, 27 and 20 characters per line respectively.

The print direction may also be software controlled in a similar manner to the pen colour by outputting a 'Q' followed by 0, 1, 2 or 3. Combining 'Q1' for top to bottom print with 'S63' for one character per line enables banners to be easily produced, if somewhat wasteful of paper.

Program 2 shows the use of the print size command to produce either a subscript or a superscript depending on the setting of a flag. Note the use of the 'A' command to return to the text mode, although this is not always necessary, since text may be output in graphics mode using the 'P' command.

The plotting facilities of the CGP115 are extremely versatile, offering move and draw commands with absolute or relative addressing. One useful feature is the ability to combine several addresses together in one command. In program 3, 12 random triangles are drawn using absolute addressing in line 80 to get the position of the triangle, then combined relative addresses in line 120 to actually draw the triangle.

Since the plotting commands available are similar to those used by the BBC or Atom, high resolution graphics may be easily transferred from screen to paper by modifying the existing software. The only time this may be a problem is when the bit pattern is poked directly to the screen memory. This cannot be done directly with this type of printer, but program 4 is a screen dump to transfer mode 4 graphics from screen to paper.

Graphs are obviously no problem, with commands being available to draw positive and negative X and Y axis, and the ability to move the origin around the paper. Program 5 demonstrates graph drawing and is in fact an 'Atomised' version of a program taken from the manual.

One of the major uses of a printer is for program development. Being able to see the whole listing makes bug hunting easier, and problems can often be seen more quickly than when working from a screen. Program 6 improves this facility. It is designed to sit in the upper text area of an Atom, from 8200 on, and will take any program in the lower text area and do a formatted print-out. All REMs are highlighted in red, and the first REM of a group causes a linefeed, thus paragraphing the coding. The program standardises the spacing between line number and statement and indents according to the nesting level if in a FOR/NEXT or a DO/UNTIL loop. Listing 6 was obtained by the program listing itself (cassettes are available from the author at £3.50).

CGP115 Colour Graphics Printer. £149 from Tandy stores. Pens, £1.99 for 3. Paper rolls (4½in x 150ft), £4.99 for 3.

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different colour. I have therefore used only eight patterns for colours 0 to 7, and repeat them for colours 8 to 15. The patterns are shown in figure 10. The pixels are rectangular, so a four by two matrix is used (six by two for the Epson). The approach differs between dot-band and line-of-dots printers. The former will require the preparation and printing of four (or six, printer bytes, putting two bits into each. The latter will require that each line is scanned twice, and the printer byte will have to be rotated four bits at a time by multiplying by 16. A program of the first type, written for the Epson, was published in November. The techniques are not identical to those above, but the principles are unchanged.

Program 5 is a mode 2 dump for the Olivetti. The patterns are defined in lines 1005 to 1013. The picture is defined in line 1016, in a similar way to the mode 0 dump.

Line 1030 takes care of the flashing colours, by translating colours 8 to 15 into 0 to 7 repeated. The screen scan, byte preparation and printing are as usual, for a plan A dump.

The dumps have been presented in three groups, dumping modes 0, 145, and 2 respectively. It is possible by amalgamation, or turgid programming, to write a single program to dump all modes. I have avoided this, as the complexity makes them difficult to explain simply. One normally knows which mode a graphics program is written in, and can select the appropriate dump. The approach advocated in the previous article was to save the dumps as procedures and merge them on to the graphics program, calling them up as desired. There are other ways.

One is to chain the graphics dump. This is perfect for disc users, no unwanted 'searching' messages appear, and the dump runs automatically. It is possible to suppress the unwanted messages by the trick mentioned in the June article, or by using the appropriate *FX3 call, which does *not* operate as in the *User Guide*, and whose workings will be discussed separately. The second approach is to have a small procedure to select and run the appropriate dump for you. I do not find this valuable, but the program brings together threads culled from the pages of this magazine. It leaves your original graphics program intact, and ready to be re-run.

The procedure is called PROCDUMPIT and uses the USR function to check the current mode in lines 1001 to 1004. An error message is issued if the program is not in a graphics mode (lines 1005, 1014 and 1015).

FNmax determines the maximum X text parameter, and lines 1006 and 1007 define a single character text window, which lines 1007 and 1010 fill to the current colour. The appropriate program is then loaded above the original by resetting PAGE (line 1011) and RUN.

Disc driven micro owners should now reset PAGE to &1900, and tape users to &0E00 to recover their original program. This can be inserted as the last line of each DUMP program. Note that your three dumps will have to be called DUMP0, DUMP145, and DUMP2.

All the dumps used so far are slow, taking up to 30 minutes for a complete screen dump in the worst cases. In the next article I will introduce a small dose of assembly language to liven the proceedings.





PRIMARY PROGRAMS

John Corder and Gary Hunt examine five educational packages

AS THERE is so little software around for the BBC micro which might be classified as 'educational', we were keen to try five short programs from Schoolsoft.

Addition deals with pairs of numbers between one and nine. If the user answers correctly, two notes sound and, after a pause to print the complete sum, the program moves on. An incorrect response produces a buzzing signal and the message: 'That's wrong Peter. Watch the men to see what the answer should be.' Simultaneously, the sum is displayed using the appropriate number of matchstick men who walk across the screen to the answer box.

After 10 questions a work record appears which shows all questions with their correct answers, a tick or cross to show whether the user got each one right, and a total. 0,1 or 2 is classed as 'poor', 3 to 5 is 'fair', 6 to 8 is good and 9 or 10 superb.

A number of criticisms could be made. Children who made mistakes were unable to read the computer's response and watch the graphics at the same time. They found the language used too difficult – and showed it to be superfluous by concentrating on the graphics alone.

To run the program again pupils are invited to press the space bar. If any other key is accidentally depressed the program stops and there are no instructions to type RUN to restart. Obviously, with young children in mind, it would have been far better, and easy, to depress any key to restart. It would also mean less disruption.

The *Subtraction* program involves numbers less than 10 and, when a mistake is made, a double-decker bus moves across the graphics section of the screen. For the question 3–2= the bus has three people on board, two of whom get off at a bus stop. The bus then moves to the final stop where the remaining person alights to deliver the correct answer of 3–2=1. This answer flashes for a short time. If the child has difficulty, pressing the space bar splits the colours of the people on the bus. All the black ones alight first and those that remain are blue.

Simple Addition £10; Simple Subtraction £10; Simple Multiplication £10; Simple Division £10; Carousel £5. From Schoolsoft, 19 Shadwell Grove, Radcliffe-on-Trent, Nottingham.

As with several of these programs, and this one in particular, many children enjoyed the graphics so much that they made deliberate mistakes. After 10 questions a result sheet is displayed similar to that described in the addition program. This happens in the multiplication and division programs as well.

Multiplication deals with small questions up to 5 x 5. If the answer is correct the program moves on to the next question, if not a steam engine appears (complete with sound effects) with the appropriate number of round dots lined up on its tender. For example, 4 × 3 is represented as four layers of three dots. The child can again ask for help. For example, with the question 4 × 5 =, four groups of five dots will appear in the graphics area above the engine.

The format of *Division* is similar to that of the previous three. The most difficult question was 20/4=. An incorrect answer produces a cricketer who bats the appropriate number of dots into boxes. For 16, he would bat four balls into four boxes.

Text saying the answer is wrong and that the child should look at the pictures, only appears for about six seconds. None of the children could read it in that time and they again found written instructions unnecessary.

Many children commented that there was no facility to delete an error. Some children also found initial difficulty because, after entering their name at the beginning of each program, they are not told to use the return key. Nowhere else in these programs is this necessary.

Carousel is similar to the game 'Simon' where a sequence of coloured sectors appears and the user has to remember and record them in the correct order. If he/she is successful, an extra colour is added to the sequence; if the order is incorrect the proper sequence is displayed. Children enjoyed playing this game, although those who have Simon at home tell us it does not stop after a sequence of 10 colours has been recalled as this program does. Our reactions to the programs were predictable; a mixture of disappointment, enjoyment and that feeling 'if only we'd been there at the beginning...' Minor changes could make them much more acceptable to teachers. Nevertheless children enjoyed and benefitted from using them. Comment was passed as to how useful it is to know whether children are getting the answers right by listening to the sound effects.

Of the limited amount of software available, the programs are probably the most suitable material we have yet found for children at the early stages of these processes. It just seems unfortunate that the problems we found in a couple of weeks could easily have been anticipated.

- *John Corder and Gary Hunt teach at Oval Primary School in London.*

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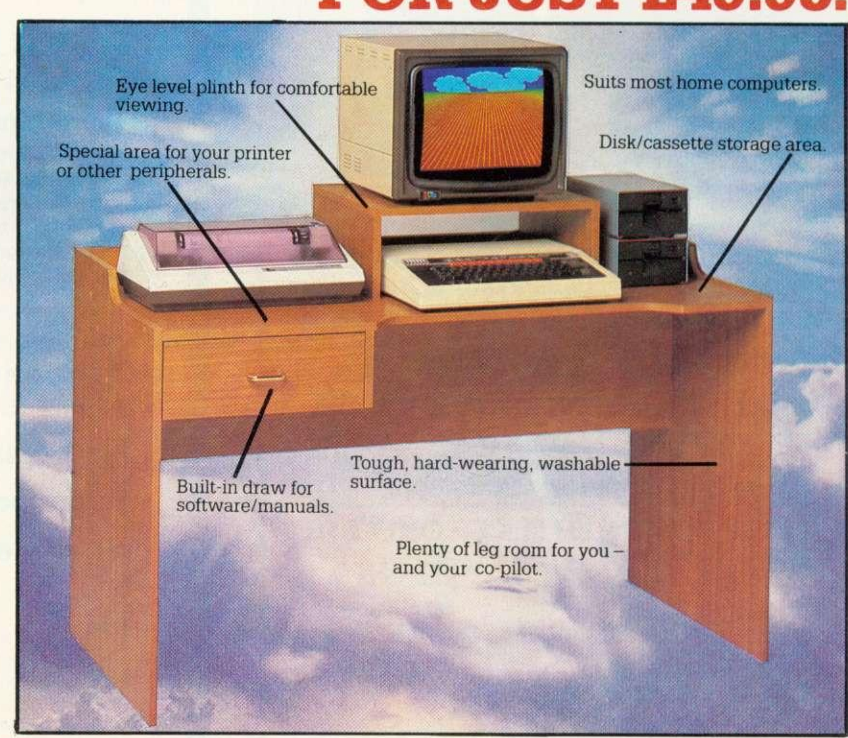
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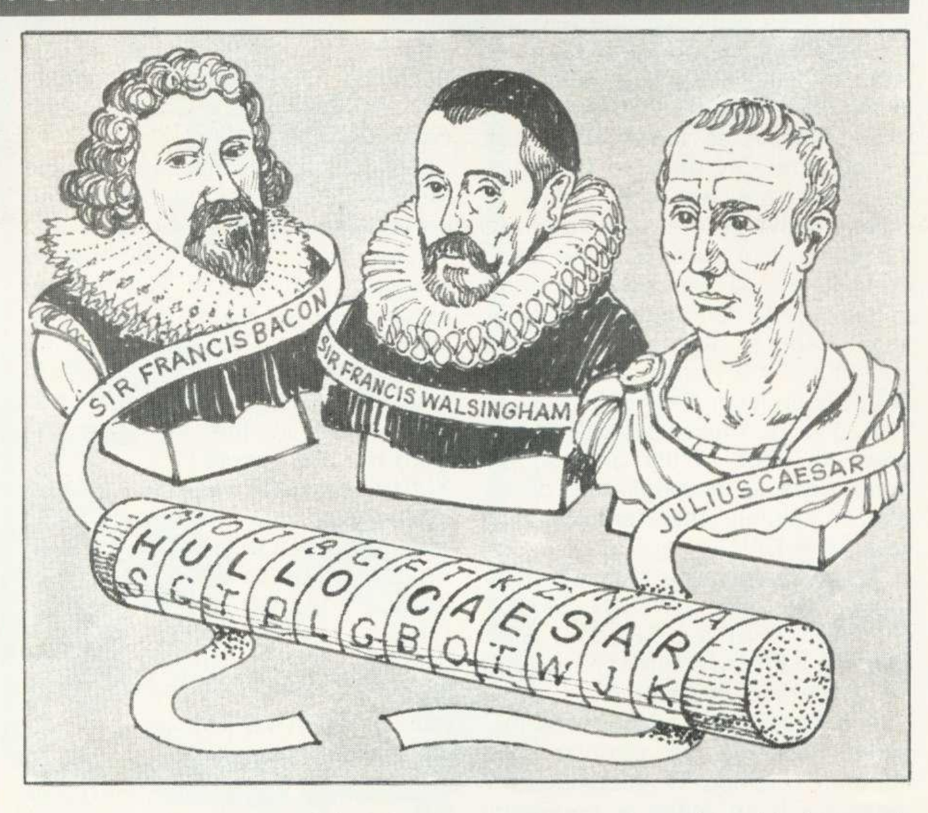
Address ....



SOLVE THE PLAYFAIR CIPHER AND WIN 2 ACORNSOFT TAPES

CODES, ciphers and secret writing are as old as man himself. From the day people discovered secrets to impart, they had to devise means of rendering them meaningless or invisible to prying eyes.

One of the earliest methods was devised by the Greeks whereby a message was written across thin strips of parchment wound tightly round a cylinder. When unravelled it could be read only by someone who had an identical cylinder to wrap the parchment around!



Julius Caesar used a simple substitution cipher for his military communications – eg A became B, B became C, etc – the sort virtually anyone can crack within a few minutes. In this respect he was typical of many great military figures who, despite the fact that most advances in cipher technology have occurred because of the demands of the military, become too involved with waging war to ensure professional cryptographic security is preserved. The brilliant Polish and British cryptanalysts who deciphered messages from the German Enigma machine in World War II (see *Acorn User*, October) time and again found their way into the system because of sloppy discipline on the part of the German operators.

The Elizabethan age saw explosion of interest in these matters, perhaps because of the activities of Sir Francis Walsingham, one of Elizabeth I's principal secretaries. Many historians believe he was the founder of the modern-day police state with a network of spies and informers going hand in hand with repressive political measures.

One of the more famous ciphers of the day was Francis Bacon's bilateral cipher, which relied upon a printer using two different type founts in setting a given passage. The differences between the founts had to be unnoticed to the casual reader, but could be picked out by those in the know. Elizabethan printing was frequently a slapdash affair but this hasn't prevented generations of avid members of the Baconian society from poring through the *First Folio* to prove their hero wrote Shakespeare – and left a message to prove it.

For those who like this sort of thing, a fascinating and in places hilarious book called *The Shakespearian Ciphers Examined* is a must. It's a close analysis by William Friedman, one of America's top cryptanalysts in World War II, of the methods employed by such diligent Baconians as I. Donnelly and Mrs Gallup to prove their case. The book demonstrates, using the same deciphering techniques as the Baconians, that Shakespeare was written by the Earl of Oxford, Christopher Marlowe, Mrs Gallup – and even the Friedmans themselves!

Modern-day ciphers are, of course, computer-based (often using prime numbers well over three hundred digits long) and are generally thought to be unbreakable. Nevertheless, the principle that what one man can do another can undo remains – and history is littered with examples of 'unbreakable' codes being solved, the Enigma machine being only one example.

For this puzzle we're giving you a Playfair cipher to unravel. This cipher was devised by a talented Englishman, Sir Charles Wheatstone (1802-75), in the 1850s, and named after his friend Baron Playfair, who did much to promote it.

It gained enthusiastic approval because of its ease of use combined with its high security features, and continued to be used, with modifications, throughout World War II. A simple version works as follows. First the alphabet is reduced to 25 letters (J is dropped) and a five by five grid is set up – the Basic equivalent of programming the computer to DIM GRID(5,5).

The alphabet is then inscribed on to the grid using a keyword or phrase known to both sender and receiver, let us say in this example: *to be or not to be that is the question*. Each letter is used once only, so our actual keyword is TOBERNHAISQU. Then the remaining letters of the alphabet are placed on to the grid in alphabetical order, to give:

T	O	B	E	R
N	H	A	I	S
Q	U	C	D	F
G	K	L	M	P
V	W	X	Y	Z

Suppose we wish to send the message *the unjust war will soon be over*, we first remove all blanks, substitute an I for any Js, and split it into two-letter groups (digraphs). Where any pair of letters is the same a padding letter (Z) is inserted and again Z is added at the end if the final letter is left on its own. Our message now looks like this: TH/EU/NI/US/TW/AR/WI/LZ/

LS/OZ/ON/BE/OV/ER.

To encipher each digraph you look at the position of the relevant two letters in the grid and for each letter substitute the letter which is in the same row as itself but in the same column as its partner. Thus TH become ON and EU becomes OD. There are two other points to note. First, where both letters are in the same row substitute the letter immediately to the right of each letter (HA=AI). Second, where both letters are in the same column substitute the letter immediately below each letter (OU=HK).

If any of these operations go over the edge of the grid, simply scroll back to the beginning of the row or column. Therefore HW=UO and BR = ET.

Our fully encoded message now looks like this: ONODH SFHOV SBYHP XPARW THERT WRT (placing it into five letter groups is a cryptographic convention).

It is easy to understand why this cipher became so popular. The standard method of attacking any message is to make a frequency count (the commonest letters in the English language are ETOANI), but a frequency count here is of little help because each letter can be virtually anything. In addition, the ease with which this method can be learned gives it a flying start over its more time-consuming competitors.

All the same, the Playfair cipher suffers from weaknesses which lay it wide open to attack. First, though the frequency count of the individual letters has been stymied there are digraph charts available for almost every language (the commonest digraphs in English are TH,ER,ON,AN,RE,HE,IN,ED,ND,HA, AT,EN,ES,OF,OR,NT,EA,TI,TO,IT).

Because TH will always become ON (in our chart) sooner or later the enemy will have enought material to crack it. Of course, we could get round this by running the encoded message through another Playfair cipher and yet another . . . but then we would lose its big advantage – simplicity. A second weakness is that – as Enigma showed – when operators are asked to use keywords of their own devising, time and again a lack of imagination lets them down and they revert to using their initials or names of girlfriends. Worse still, they sometimes use keywords linked to the text itself through an association of ideas. The final and most fatal flaw is that a digraph is a mirror image of its enciphered version. In other words if TH becomes ON then HT becomes NO: this enormously assists the cryptanalyst.

The following message in the form of a Playfair cipher has landed on your desk. The only clue is that you're up against the same operator you met in *Acorn User* before. He's known to favour keywords of a literary flavour – eg titles of plays, books or poems. Also, it is suspected that somewhere in the message the word HITLER occurs.

KMUIL OMRNF ESRKU KAEKF
KROMR LSVLO RWROL OUICO
MKGEB EOGLV LOLRK MMBWC
KSFNM CRBEC ORHCB CDWDT
CKNOY IAKAR EXFIC EECCG
CECMT NKPAL RWSKC MLOCN
CAOLW TVZFQ SIBMO MRLSP
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What is the message?

This month's competition for under-13s. Please give your school and class with your answer. Find the highest number you can using all the digits from 1 to 9 once and once only which can be formed by multiplying two other numbers which together contain all the nine digits once only.

Answers on a postcard please to August Competition, *Acorn User*, 53 Bedford Square, London WC1 to arrive not later than September 5.

APRIL RESULTS

Result of April's competition
An excellent response to both competitions and it's good to see all you under-13s programming away.

The answer as to whether there are any days of the week on which a new century cannot begin is yes: Sunday, Wednesday and Friday, which about 70% of the 100 entrants got right.

The perfect squares formed by KING and KNIGHT were 3721 and 327184. Only two wrong entries to this one.

The winners were Vicki Bell of Charlton Park School, Glos, James Wilson of Lanark and D.M. Laugharne of Northwich, Cheshire to whom Acornsoft packages have been sent. Several readers sent in mathematical proofs of the Century problem, the most concise and elegant of which came from J.G. Banks of Rickmansworth.



THE LITTLE

VERSATILE, RUGGED, FAST AND GOOD VALUE IS CHRIS SMITH'S OPINION

THE Blackboard Electronics Analogue/Digital Converter plugs into the input/output user port on the underside of the BBC micro via a ribbon cable. It is powered from the computer, making it versatile, convenient and fast. Analogue signal can be converted to eight-bit digital readings in less than 9μs so frequencies of 10 KHz can be resolved. Blackboard Electronics talks of a faster machine being produced in the near future which will be able to cope with radio frequencies.

The processor section comprises a variable gain amplifier (X1 to X100); a high impedance input

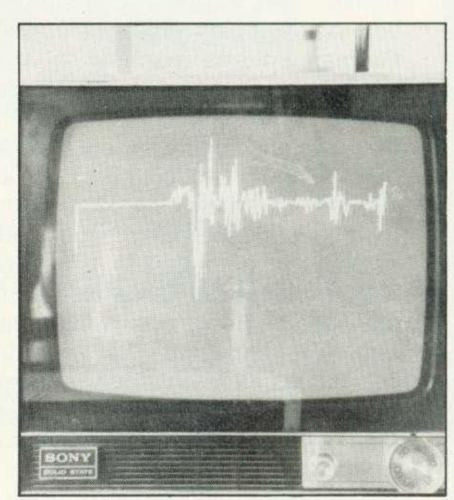


Figure 1.

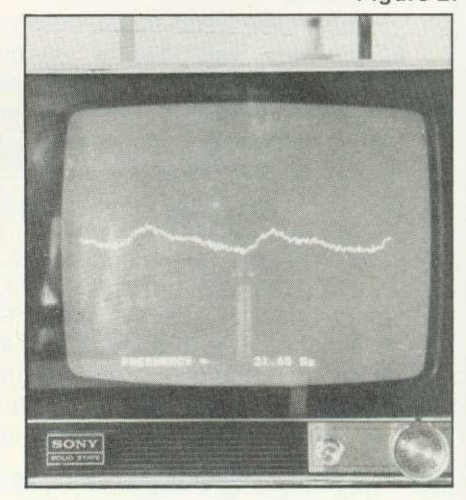


Figure 2.



BLACK BOX

buffer (10^{12}); a level shifter; and a switchable, variable, two-stage, bilateral current source ranging from 1A to 10mA, each infinitely variable down to zero.

So we have in effect a unit which will act as a large screened storage oscilloscope, or as a large readout three-digit multimeter. This versatility means the machine can interface the computer with a large number of transducers, including resistive types, directly and safely (although the VIA must be fitted to the model A).

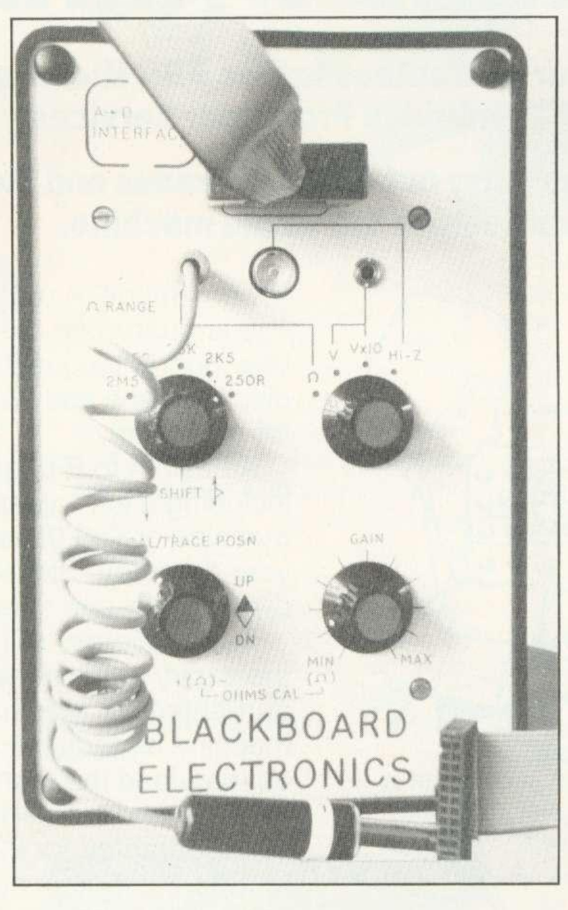
The software supplied is well written and can be adaped for individual needs. The instructions it gives are easy to understand and use. The makers even include a listing, which shows their open mindedness, and desire to see it used wherever possible. An example of this is given in the instructions where details of an inverted display from resistive transducers and pH probes and light-dependant resistors (LDRs)are given.

The A/D Converter can be used to measure sound (an example is shown in figure 1), and, in its faster modes, will resolved whistling into a sine wave.

Voltages can be measured easily (up to 25V), either as a graph or large digits. This has particular advantages and uses in the lower secondary school where class voltmeters are a rarity, and expensive.

Voltages as low as 25mV can be measured using the internal operating amplifier and a further amplifier is available from BE which will monitor even smaller voltages. It should be stressed here that the machine is thoroughly protected against idiots who inadvertantly, or deliberately, apply high voltages. I don't recommend it, but the buffering would protect it against even mains voltages.

Several attachments are available as optional extras. One is the LDR light detector which can be used for a number of different experiments (the calibration graph supplied works out actual light intensities). One interesting experiment is to point this sensor at a mains driven, incandescent light bulb. The trace speed can be increased to demonstrate the 100Hz wave form of the filament heating and cooling in response to the 50Hz mains voltage.



Blackboard's black box A/D converter is reasonably priced at £79. The user port cable and jackplug give a good idea of its size

This particular piece of apparatus can be used also as a plasmagraph to measure heartbeat simply by putting the probe over a finger, increasing the gain, and adjusting the trace position button (not easy, but well worth it when you've got it). An example trace from the plasmagraph is shown in figure 2. The ranges of options that the converter can be used for is only limited by the user's imagination and inventiveness.

There are two reservations which occur regarding this machine. The first is whether the average science teacher should be encouraged to buy an A/D Converter when a model B comes with four converters supplied. The answer is that it depends what it will be used for. There is no doubt that the BBC A/D chip is delicate, and is nothing like as sensitive, adaptable, or safe. Neither is it as fast (the Blackboard Electronics converter is over 1000 times as fast).

My second thought is the need to use more than one converter at a time – it could prove rather irritating having discovered this device, not to be able to measure more than one parameter at a time. Perhaps we shall see a multimonitor appearing in the range offered by Blackboard Electronics fairly soon.

My last comment concerns the instructions which come with the machine, which, while not poor, are certainly not particularly helpful. I was pleased to hear therefore that BE have decided to distribute their equipment through Philip Harris (the science education suppliers).

The advantage of this association with Philip Harris in terms of national support may be obvious, but the disadvantage is even more so, because the company has had to almost double its prices. However, they are still fairly reasonable (table 1).

A/D converter with program listing	£79.00
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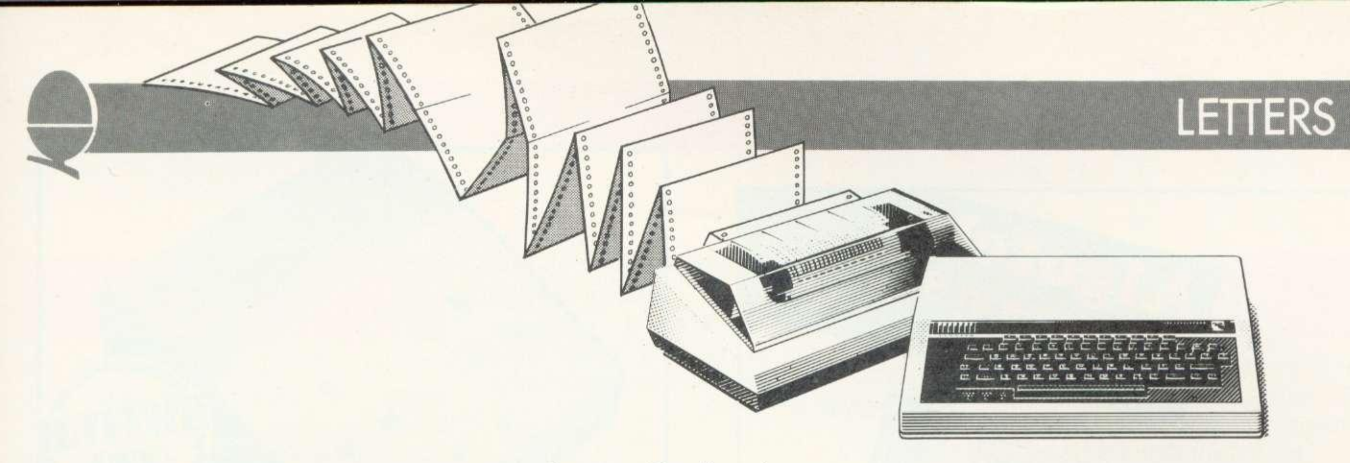
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MUSIC NOTES

Sir, After testing the published cassette of my Quicksilva Music Processor, I would like to clarify some points about the software.

The absence of a function-key label has been pointed out to Quicksilva, and I hope to see this included in the package shortly. Cassette labels will, of course, be provided.

The three music files are each nearly twice as long as necessary and should finish at blocks &1A, &26 and &28 respectively. This is also being corrected.

A minor point is the 'helicopter' sound effect given in section 7.1 of the booklet. Channel 1 settings should be: 1 09 92 0 and not: 1 09 00 0.

Andy Williams
Burton-on-Trent

TV SHUDDER

Sir, I am writing about the problem Acorn users are finding with 'shudder' or 'frame jump' occurring when games such as *Defender* are run on ordinary TV sets.

This fault is caused by the fact that in many modern TV sets there is a chip controlling the line and field sync pulses.

These sets have a TDA 2571 or similar IC which divides the 625 lines down to one for the field sync pulse, which is where the 'shudder' occurs. This method is used because in remote parts of the country the transmitted TV signal is so corrupted that there are no distinguishable sync pulses, and yet a picture can be received, so this information is used instead to get the sync pulses.

On high speed games such as *Defender*, the ULA video processor is caught out and misses the first few lines of video information, which is off screen and not seen anyway. With these lines missing the sync pulse occurs progressively later and hence the 'shudder', because the auto sync circuits detect this and attempt to re-sync the set with a 'jump'.

The same problem occurs with VCRs, so TV set designers have a button on the front of a TV set to disable the IC and use the mains frequency to lock the picture.

So please note this button is called the 'VCR button' and must be used.

We have done a lot of research into this problem as it affects most computers – not only the BBC. Also we have tried a large number of changes to the BBC and have not yet damaged or blown anything up, but many times it never works and hangs up. When things were switched off and restored the computer worked perfectly.

P. Sipos
Surrey

SEIKOSHA HELP

Sir, In November's *Acorn User*, George Hill published the final part of a program for printing a 'test card' direct from the screen onto the Epson MX80 FT2. (Would this be known as a 'screen print program' and be known as 'software'.)

I do not have the Epson but a Seikosha GP100A, bought to help me with my 'O' Level computer studies. My problem is that I cannot control my printer, it remains functional only in its preset mode.

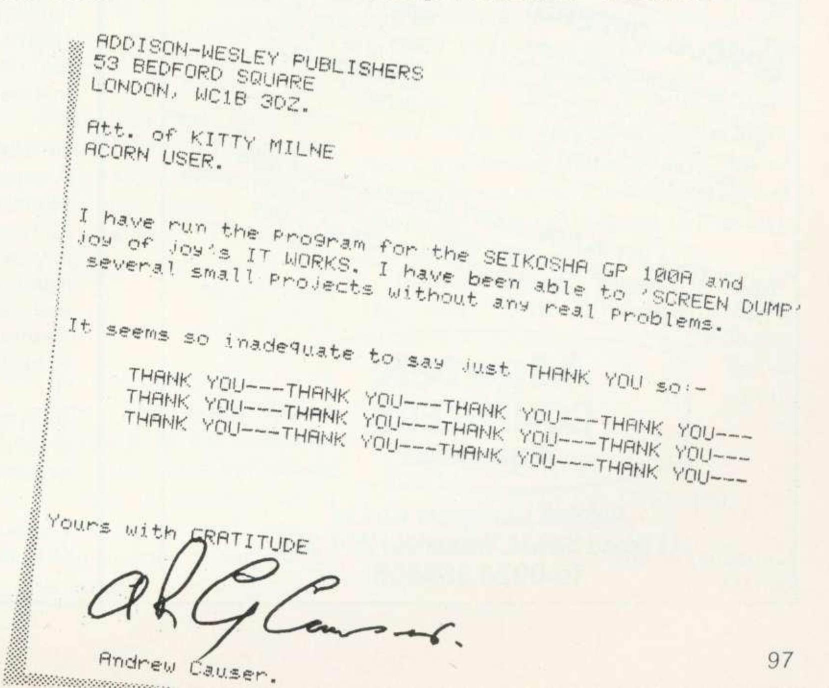
The manual supplied might just as well be written in Japanese for all the sense it makes. The retailer cannot help, and despite promises to supply 'a modified software program' to enable 'graphics printing', has yet to do so.

I need to print programs for my school which contain charts and graphs, for example, sine and cosine curves.

Andrew Causer
Birmingham

My sympathy for your bafflement with printer manuals. An information sheet on the Seikosha was written as part of the review of the Seikosha in July's issue. It includes example programs and a translation of the vital bits of the manual from the 'Japanese'. Copies are available from the *Acorn User* office (50p plus SAE).

An assembly language dump program was published in the October issue of *Acorn User*. This is scantily documented, but type it in (absolutely no mistakes allowed!), and then run it. Typing CALL BEGIN will cause it to dump the screen. A future issue will contain a shorter hybrid (Basic plus assembly language) screen dump for this printer. The series of articles on printers will, we hope, have helped you in understanding your printer, and in writing your own screen dumps , which are 'software'.



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Att. of KITTY MILNE
ACORN USER.

I have run the program for the SEIKOSHA GP 100A and joy of joy's IT WORKS. I have been able to 'SCREEN DUMP' several small projects without any real problems.

It seems so inadequate to say just THANK YOU so:-

THANK YOU---THANK YOU---THANK YOU---THANK YOU---
THANK YOU---THANK YOU---THANK YOU---THANK YOU---
THANK YOU---THANK YOU---THANK YOU---THANK YOU---

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ANNOYING CLICKS

Sir, My BBC model B seems to have an intermittent fault in that occasionally the TV picture 'freezes' and the only way out is to break. First, I would be interested to know what might be causing this and second, although Basic programs can be restored using OLD etc, how can I get back commercial machine code games programs, such as Acornsoft's 'Snapper' and 'Planetoid', since OLD and RUN (or *RUN) do not work in these cases?

Incidentally, why does the cassette relay (I assume it is the cassette relay) make such an irritating clicking noise when a program is being loaded? From time to time I get a loading problem when the machine fails to spot the beginning/end of a block and there is no corresponding click from the relay. Could this be a cause or a symptom of a fault elsewhere?

I should add that both the above problems occurred before and after a recent OS upgrade from 0.1 to 1.2 and no fault was found when the upgrade was performed by the dealer.

M. Gibson
Staffs

The most likely causes of your picture 'freezing' are mains or static glitches. A possible cause could be overheating of the machine. Your second query: commercial machine code games can't be recovered because of the software protection built into them. You'll just have to re-load them.

The relay clicks every time a block is loaded. If the block doesn't load, the relay doesn't click – it's that simple! If your machine fails to spot the beginning/end of a block then it would be a fault on the cassette, not your micro.

NEW GUARANTEE

Sir, I have recently had my model B upgraded to take a disc interface. This was carried out by Retail Control Systems within my original six months guarantee period.

According to your October 1982 issue, this extends the maker's guarantee by three months. RSC deny all knowledge of this, although they do state that their work is guaranteed for three months.

I should be most grateful if you could make it clear to me if my maker's guarantee is extended.

S. Belcher
Essex

Our news item in October repeated Acorn's statement to us at that time. However, their official line now is that the three-month upgrade guarantee has *no effect at all* on the main guarantee.

EMPTY RAM

Sir, On switching on my BBC model B and typing 'OLD', I invariably get the 'Bad program' message, even though nothing has been entered. On using a memory display program, the contents are always the same – a series of several lines with the same number 3328 all of which consist of the word trace followed by six lines of hashes (#). Entering a new program clears this; but does it indicate a faulty chip anywhere, and are there any serious problems that could result from it?

David Evans
West Midlands

The reason for the 'Bad program' message appearing when you switch on and type OLD is that the RAM is empty. You don't have a faulty chip and nothing is wrong.

FOREIGN TV

Sir, I have a BBC model B and as I am going to live in Cyprus, I would like to know what problems I would have in using the computer with a domestic TV.

I have been informed that TVs bought in the UK have to be adapted for use there. Does this mean that my computer will need some sort of adaption? If so could you tell me how much the conversion would cost?

David Guest
London WC1

Cypriot TV is not compatible with the BBC micro. The modifications required to make it so are complex and expensive. Your best bet would either be to take a monitor or a British TV with you and use a transformer to cope with mains voltage differences.

TELLY SOUND

Sir, In the May issue of *Acorn User* you published a letter from B. Sharrock and said it was not possible to have sound through the TV set.

I enclose details of the method that I used to achieve sound through a TV.

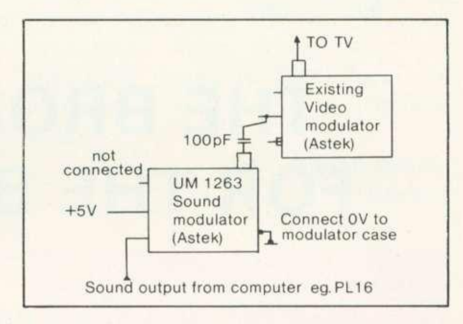
I have glued the sound modulator to the top of the existing video modulator, allowing a slight offset for the lid fixing screw.

The capacitor value was selected by trial and error. A larger value gives better sound quality but a reduction in picture quality and 100pF is about the maximum.

The 5V supply can be obtained from the PCB track connected to pin 16 of IC 45, while 0V can be obtained from the track connected to pin 7 of IC 47.

My computer has had this unit fitted since June last year and has suffered no ill effects.

J. Doggett
Middx



QUEST BUG

Sir, I would like to point out a small bug in Acornsoft's *Philosphers Quest*. It will treat any command starting with A (eg Attack) as a crawl command.

IN PROCW, which starts at 5750, the input is compared with a list of known commands, J is returned as 0 if not found. J is initially set to 0 in line 5752 but reset in line 5760 to 6.

If the command word is less than the first word (8) on the list, ENDPROC is reached with J still =6. If crawl is entered J=6 hence Attack=Crawl. This is easily corrected:

```
5775 IFX$<FNSTR(L,I) OR
  X$>FNSTR(H,I) THEN J=0:
  ENDPROC
```

Neil Washbrook
Middx

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CENTRONICS DUMP

Sir, I am searching for routines to dump graphics screens from my BBC (B) to a Centronics 739 printer. I must have written 20 letters, all enclosing stamps, to receive two replies, both negative. Can you make any suggestions? I would be very grateful even to be pointed in the right direction. We don't all own Epsons!

A. Cameron
Inverness

To write any sort of printer dump it is necessary to have a copy of the relevant sections of the manual. Mr Cameron kindly supplied these, and the dump program (program 1) was written and sent. It worked first time (remarkable that!), and other programs for the Centronics 739 have been written since, which Mr Cameron has kindly tried out.

His printer seems to be suffering from a lot of breakdowns though. Do other readers have similar problems with this printer? The print quality is superb, but reliability is important too!

```
1000 REM***CENTRONICS DUMP***
1010 REM MAIN PROGRAM
1020 PROCPRINTER
1030 PROCSCAN
1040 PROCDONE
1050 END
1060 DEFPROCPRINTER
1070 REM CALL AND ENABLE PRINTER
1080 *FX5,1
1090 VDU2
1100 REM SELECT GRAPHICS MODE
1110 VDU1,27,1,37,1,48
1120 ENDPROC
1130 DEFPROCSCAN
1140 FORY%=1023 TO 0 STEP-24
1150 FORX%=0 TO 1279 STEP4
1160 byte=0
1170  FOR y%=23 TO 0 STEP-4
1180 byte=byte*2
1190 IF POINT(X%,Y%-y%)>0THEN byte
=byte+1
1200 NEXT
1210 byte=byte+32
1220 VDU1,byte
1230 NEXT
1240 VDU1,13
1250 NEXT
1260 ENDPROC
1270 DEFPROCDONE
1280 REM SEND CANCELLING ESCAPE SE
QUENCE AND FORMFEED
1290 VDU1,27,1,19,1,12
1300 REM DISABLE PRINTER AND BEEP
1310 VDU3,7
1320 ENDPROC
```

WEARTH WARNING

Sir, I recently experienced an unusual fault on my BBC model B which resulted in damage to output buffers on the computer and input buffers on a printer connected to it.

After considerable detective work by the engineer of the Guildford Computer Centre, the fault was traced to a third piece of equipment, the distribution board to which all of the system except the printer was connected. This had a faulty earth lead. The result was that leakage currents were flowing in the signal circuits, damaging the buffers.

The story illustrates two important points. First, make sure all system earths are sound when interconnecting equipment. Second, when trouble strikes, there is no substitute for a good dealer who is prepared to back up his sales with service.

Dr. T. Wilson
Surrey

FORUM ERROR

Sir, A misprint occurs in the listing in Beeb Forum, July page 49. The command to save the program and data together should be:

*SAVE "Progname" E00 XXXX

where XXXX is the hex value of the number printed by the previous step.

The purpose of the technique is to save memory space by avoiding the use of numerous data statements within a program.

Robert Ward
Hull University

GAELSETT UPDATE

Sir, Thank you for June's careful review of Gaelsett's Extended Colour-Fill Graphics software. However Mike Milne seems to have been using the earliest version of ECFG (circa November), and has therefore concentrated on the facilities available with ECFG in mode 2, in line with the demonstration programs he had.

ECFG is in fact supported in all graphics plotting modes, and experience has shown that mode 2 is rarely the best when ECFG is present.

For instance, in mode 5, the screen can simultaneously show 289 different graduations of colour-mix from the 6561 available in mode 2, all accessed via the more user-friendly VDU 18,L,32,... ECFG option, without recourse to non-zero values of 'L'. Other sets of 289 shades can be chosen by use of VDU 19,... statements, and extra shades beyond the 289 by use of 'L' of VDU 18,L,64,... . And all this at a saving of 10k of RAM against mode 2!

For high-resolution graphics, mode 1 provides the same facilities as above for mode 5, but with a typical pixel resolution of 1/32 x 1/32 inches on a 14 inch monitor, so that ECFG's colour-mixing shows much less graininess, and is therefore preferred over mode 2 in terms of both the ECFG capability as well as line-drawing resolution. On a non-ECFG machine, execute VDU 23,240,&AA, &55, &AA, &55, &AA, &55, &AA, &55: VDU 240,240,10,13,240,240,18,1,129, 16 in mode 1 versus mode 5.

The other point I would like to mention is that ECFG is not so much a 'program' as a machine-code extension which adaptively grafts itself onto whichever version of the operating system it finds in the machine. In this way ECFG facilities are available in Basic, or via OSWRCH calls in assembler, or as VDU statements executed from the keyboard. It will survive use of the break key.

ECFG has been designed to adapt itself to any future MOS, which is illustrated by the fact that it has been found to work without modification on the Electron. This is the more remarkable since ECFG uses unsupported jumps to MOS locations, otherwise it could not be implemented in ½k.

David Reader
Gaelsett

PLUG TO BLAME

Sir, My BBC B has had two of the heart-sinking faults described by several others but I haven't seen my simple solutions published in *Acorn User*. The first fault was the TV picture apparently 'falling' several times a second. I found that the plug going into the TV aerial socket had an unsoldered shield wire and the cure was to split this plug and clamp half the strands between each half of the plug before pushing back the plug's outer cover.

The second fault was the 'Block? Header? Data? Rewind tape' message often obtained when trying to load programs I'd written and saved myself. My tape recorder has an automatic recording level control and putting a 2kohm resistor in series in the microphone lead connecting the tape recorder and the computer worked perfectly for me.

Martin Urban
London

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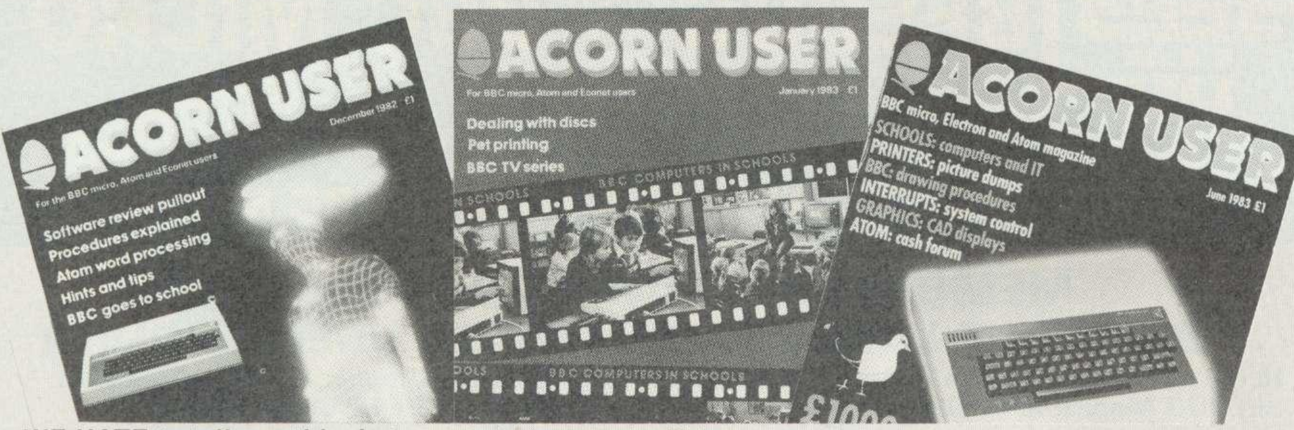
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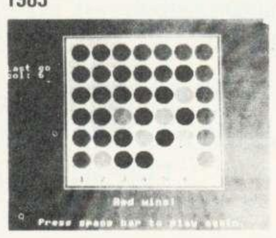
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March Issue: Program Features: Life (32K), Artillery Duel (16K/32K), Square Dance. 3D Rotation (will rotate any object). Printers for the BBC micro—Review of Epson, Seikosha, Tandy and Olivetti. What to do with the new Operating System, Disc Formatter Program, and full Disc instruction set, Newcomers article on Text and Graphics Windows. PLUS How to get a new Operating System ROM and a special deal on Wordwise (members only).

April/May Issue Special Anniversary Issue—Contains index to the whole of BEEBUG Volume 1. Music Composer—create complex 3 part harmonies with this synthesiser Program. **Colour bar chart generator program.** Beeb implementation of the **Connect-Four Game. Invasion**—a 16k. Plus **Review of Tape Recorders for the Beeb;** a Basic Program Editor, which lists variables and procedures, and executes Find and Replace in a Basic Program; **Reviews of Acornsoft Games** and the **Torch Z80 Disc Pack.** Disc Menu Program. Newcomers introduction to Mode 7. How to save the unsavable; and a routine to print Double Height Characters in all modes.

June Issue: Program Features: **'Return of the Diamond'** A 16k adventure game, **'hedgehog'** a well implemented 'frogger' type game, and **Ellipto.** Create your own off the shelf sound effects with **Sound Wizard.** Plus articles on **Using Files, Rotating and Expanding Characters, Using Printers,** and **How to multi-program the User Keys.** Reviews of **The Hobbit Floppy Tape System, Adventure Games, and a Comparative Review of Wordwise and View.** Plus **FX Call Update, Disc Program Auto-relocator, Wordwise Update,** and more **BBC Book Reviews.**

July issue: Games: Robot Attack (32k) and Anagrams, a 16k word game. Watching the Beeb at work—a sample program to show your micro at work. An introduction to discs—what are they and are they worth getting. Balloons—a coloured animation. Make your micro speak like Kenneth Kendal. Bad Program Lister—lists programs even when the computer pronounces them 'bad'. Reviews of Epson and Seikosha's new printers. Five books of programs reviewed, plus more software reviews. Using Files Part 4. A full disc sector editor program—to read and retrieve lost disc files, and how to modify Acornsoft's Planetoid. Plus hosts of useful hints.

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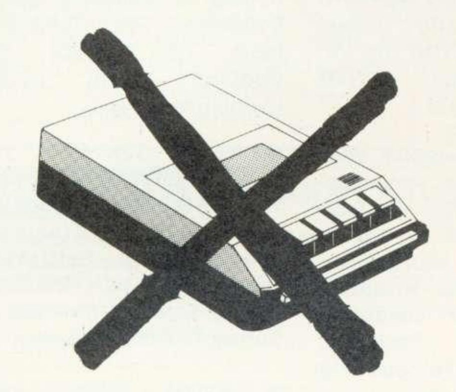
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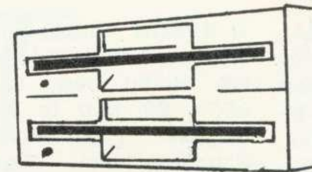
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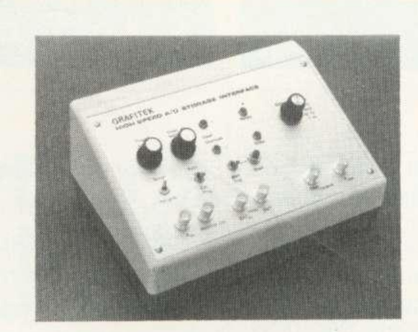
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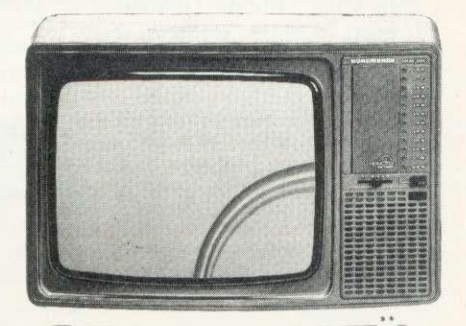
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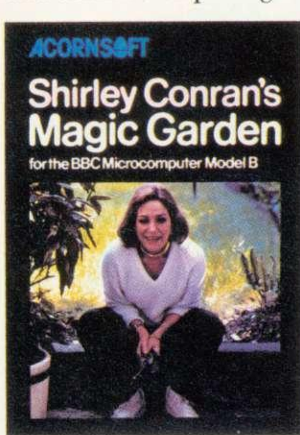
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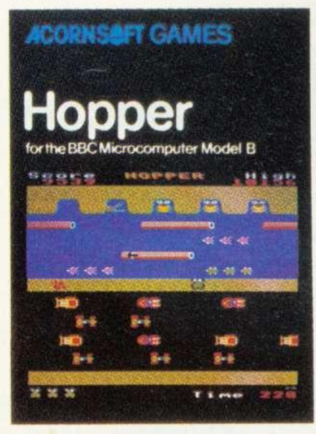
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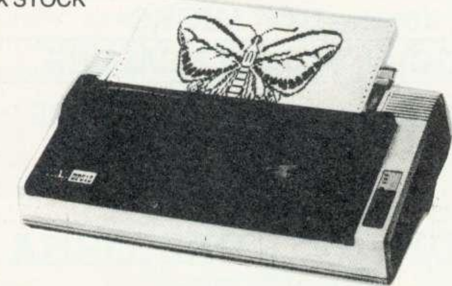
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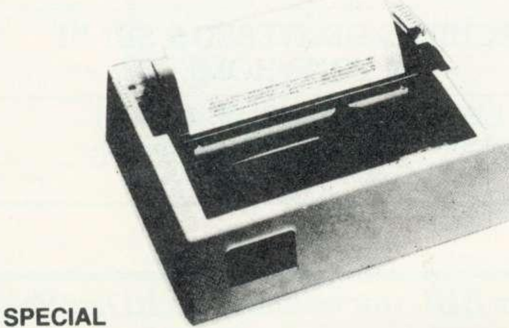
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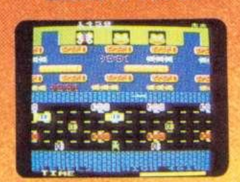
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